Cirripedia (Crustacea) from the "Campagne Biaçores" in the Azores region, including a generic revision of Verrucidae

Paulo S. YOUNG
Museu Nacional, UFRJ
Quinta da Boa Vista, 20940-040, Rio de Janeiro, RJ (Brazil)

Young P. S. 1998. — Cirripedia (Crustacea) from the "Campagne Biaçores" in the Azores region, including a generic revision of Verrucidae. *Zoosystema* 20 (1) : 31-92.

ABSTRACT
The cirripeds sampled by the N. O. *Jean Charcot* from the Azores region include thirty-four species: twenty lepadomorphs, eight verrucomorphs and six balanomorphs. Among these are two new species: *Arcoscalpellum eponkos* n.sp. and *Tesseropora arnoldi* n.sp. and several little known species. The family Verrucidae is revised, and a key to the genera is included. *Verruca* and *Metaverruca* are rediagnosed, two new genera are proposed: *Newmaniverruca* n.g. and *Costatoverruca* n.g. A list of recent species of Verrucidae is provided, reported with keys to all of the species. Forty-five species of cirripeds are reported from the Azores region, of which one third are endemic.

KEY WORDS
Cirripedia,
Verrucidae,
new genus and species,
Azores region.

RÉSUMÉ
Cirripèdes (Crustacea) de la « Campagne Biaçores » dans la région des Açores, avec une révision des genres de Verrucidae. Les cirripèdes recueillis par le N. O. *Jean Charcot* dans la région des Açores comprennent trente-quatre espèces : vingt Lépadomorphes, huit Verrucomorphes et six Balanomorphes. Parmi eux, deux espèces sont nouvelles : *Arcoscalpellum eponkos* n.sp. et *Tesseropora arnoldi* n.sp., et plusieurs peu connues. Les Verrucidae sont révisés et une clé des genres est incluse. *Verruca* et *Metaverruca* font l'objet d'une diagnose émendée et deux nouveaux genres sont proposés : *Newmaniverruca* n.g. et *Costatoverruca* n.g. Une liste des espèces actuelles de Verrucidae est fournie, ainsi que des clés pour toutes les espèces. Quarante-cinq espèces de cirripèdes sont signalées de la région des Açores, dont le tiers est endémique.

MOTS CLÉS
Cirripedia,
Verrucidae,
nouveaux genres et espèces,
région des Açores.

INTRODUCTION

The "Campagne Biaçores" undertaken by the N. O. *Jean Charcot* and directed by Dr Jacques Forest, sampled the Azores Region from the intertidal to the abyssal zone (4700 m), especially along the Mid-Atlantic Ridge. During the cruise at the West European Basin deep-sea samples were collected.

The deep water fauna of the Azores region is better known than that of shallow waters. This is the result of dredging by the *Challenger*, *Hirondelle*, *Princesse Alice*, *Travailleur*, *Talisman*, and more recently by the *Meteor* (Hoek 1883; Aurivillus 1898; Gruvel 1900a, b, 1902a, 1920; Young in press). The species found in shallow waters were described by Pilsbry (1916), Newman & Ross (1977) and Baker (1967). The latter paper by Baker is based on collections from the Chelsea Expedition at São Jorge Island.

The present study describes the cirriped species collected during the "Campagne Biaçores" from intertidal to abyssal depths. The verrucids collected during this cruise form the basis for a review and revision of the Verrucidae.

All the specimens are deposited in the Muséum national d'Histoire naturelle, Paris (MNHN), the Museu Nacional do Rio de Janeiro (MNRJ) and the United States National Museum (USNM).

Abbreviations used are as follows:

tl	total length;
rc	rostro-carinal diameter.

EARLY STUDIES ON THE BARNACLES OF THE AZORES

The barnacles from the Azores region were collected first by H. M. S. *Challenger*, which dredged around the archipelago. Hoek (1883) described two new species, *Scalpellum acutum* and *Dichelaspis sessilis*. Aurivillius (1898) described nineteen species from this region based on collections from the campagnes of *Hirondelle* and *Princesse Alice*: *Scalpellum debile*, *S. rigidum*, *S. mamillatum*, *S. anceps*, *S. molle*, *S. erectum*, *S. grimaldii*, *S. calyculus*, *S. falcatum*, *S. incisum*, *S. pusilum*, *Poecilasma unguiculus*, *Verruca recta*, *V. costata*, *V. aequalis*, *V. inermis*, *V. crenata*, *V. cornuta* and *V. sculpta*.

Gruvel (1900a, b) described the species collected by the *Travailleur* and *Talisman* later described in detail (Gruvel 1902a). In the present study eight species new to the Azores are redescribed: *S. edwardsii*, *S. recurvitergum*, *S. atlanticum*, *S. striatum*, *S. luteum*, *V. erecta*, *V. trisulcata* and *V. linearis*. In addition *S. regium* Thomson, 1873, and *V. strömia* (Müller, 1776) were reported from this region. Gruvel also reported *S. gigas* Hoek from the Azores region, but the coordinates presented appear to represent specimens collected off the coast of France.

Pilsbry (1916) described *Megabalanus tintinnabulum azoricus* and recorded *Balanus trigonus* Darwin, 1854, and *Chthamalus stellatus stellatus* (Poli, 1791), all of which are shallow water species.

Gruvel (1920) provided the most complete study of the barnacles from the Azores, based on a series of collections made by the yachts of S. A. S. le Prince de Monaco. He reported thirty-seven shallow and deep water species, and added new information regarding the following species: *S. vulgare* Leach, 1824, *S. velutinum* Hoek, 1883, *S. alboranense* Gruvel, 1920; *S. gracile* Hoek, 1907a, *S. pilsbryi* Gruvel, 1911, *V. spengleri* Darwin, 1854, *B. amphitrite* Darwin, 1854, and *B. spongicola* Brown, 1844.

A collection made in the shallow waters of São Jorge Island (Baker 1967) confirmed the occurrence of *C. stellatus*, *B. trigonus*, *B. tintinnabulum azoricus*, and *V. spengleri*. Baker (1967) reported the presence of *Tetraclita squamosa elegans* Darwin, 1854. However, Newman & Ross (1977) indicated that *T. squamosa elegans* likely represents a new species, *Tesseropora atlantica*.

Zevina (1976) recorded *S. vitreum* Hoek, 1883, and *S. michelottianum* Seguenza, 1876, from the Azores and described *S. limpidus* from off northeast of this archipelago.

Young (in press) studied the fauna of the Great Meteor Bank and recorded *Heteralepas microstoma* (Gruvel, 1901) from this region.

THE SPECIES FROM THE "CAMPAGNES BIAÇORES"

Order PEDUNCULATA Lamarck, 1818
Suborder HETERALEPADOMORPHA Newman, 1987
Family HETERALEPADIDAE Nilsson-Cantell, 1921
Genus *Heteralepas* Pilsbry, 1907a

Heteralepas microstoma (Gruvel, 1901)

Alepas microstoma Gruvel, 1901: 259; 1902b: 282, pl. 24, figs 1B, B', 7, 8; 1905: 162, fig. 180.

MATERIAL EXAMINED. — Stn 73, 1 specimen, tl: 2.4 cm, on a gorgonian, MNHN Ci 2562.

REMARKS
Heteralepas microstoma is a common species from the Azores and Madeira Archipelagos, and the Great Meteor Seamounts (Young in press). It ranges from depths of 269 to 623 m, but more commonly around 300 m, forming large aggregations usually fixed on the stem of octocorals.

Suborder LEPADOMORPHA Pilsbry, 1916
Family OXYNASPIDIDAE Gruvel, 1905
Genus *Oxynaspis* Darwin, 1852

Oxynaspis patens Aurivilius, 1894

Oxynaspis patens Aurivillius, 1894: 38, pl. 3, figs 1-2, pl. 6, figs 13-15; pl. 8, fig. 9. – Totton 1940: 476, fig. 16. – Pilsbry 1907a: 79. – Weisbord 1979: 39, pl. 3, fig. 6-9. – Zevina 1982: 36, fig. 26.

MATERIAL EXAMINED. — Stn 89, 2 specimens, tl: 0.9-1.0 cm, MNHN Ci 2563.

REMARKS
Oxynaspis patens was described by Aurivillius (1894) based on specimens from Anguilla Island, Antilles, between depths of 125-355 m, and later recorded from the Bahamas (Pilsbry 1916), and Josephine and Great Meteor Seamounts, between 170-300 m (Young in press). The record of this species from the Azores confirms its occurrence in the Eastern Atlantic (Fig. 1).

Oxynaspis celata Darwin, 1852

Oxynaspis celata Darwin, 1852: 134, pl. 3, fig. 1. – Gruvel 1905: 103, fig. 114. – Nilsson-Cantell 1921: 226, fig. 37.

MATERIAL EXAMINED. — Stn P44, 1 specimen without carina, MNHN Ci 2536.

REMARKS
This specimen may be identified with certainty as *O. celata*, but lacking in the carina, the subspecies cannot be identified. Based on the geographical distribution (Fig. 2), it is probably *O. celata* s.str.
Bacon (1976) and Leta & Young (1996) accorded species status for *O. celata hirtae* Totton, including all of the references to *O. celata* from the Western Atlantic. Figure 2 presents the general distribution of the *O. celata* group, including the distribution of *O. hirtae*.

Family POECILASMATIDAE Annandale, 1909
Genus *Poecilasma* Darwin, 1852

Poecilasma aurantia Darwin, 1852

Poecilasma aurantia Darwin, 1852: 105, pl. 2, fig. 2.

Poecilasma Kempferi var. *aurantium* – Gruvel 1902a: 31, pl. 4, figs 1-2; 1905: 115, fig. 129. – Weltner 1922: 79.

Poecilasma kaempferi aurantia – Zevina 1982: 98, fig. 86m.

MATERIAL EXAMINED. — Stn 62, 9 specimens, tl: 0.5-1.8 cm, MNHN Ci 2559, MNRJ 8869. — Stn 148, 14 specimens, tl: 0.5-1.2 cm, MNHN Ci 2575, MNRJ 8870. — Stn 157, 10 specimens, tl: 0.4-1.2 cm, MNHN Ci 2581, MNRJ 8871. — Stn 159, 1 specimen, tl: 1.5 cm, MNHN Ci 2583. — Stn 180, 2 specimens, tl: 1.1-1.3 cm, MNHN Ci 2665. — Stn 199, 2 specimens, tl: 0.8-1.1 cm, MNHN Ci 2609. — Stn 237, 8 specimens, tl: 0.4-1.0 cm, MNHN Ci 2628.

REMARKS
Some of the species assigned to *Poecilasma kaempferi* group are questionable, because most of them do not have readily diagnostic characters (Young in press). The specimens herein studied are assigned to *P. aurantia*. All of the specimens

examined agree to Darwin's (1852) description of *P. aurantia*, and the type locality of this species is the Madeira Archipelago. A revision of this group is needed.

Genus *Glyptelasma* Pilsbry, 1907a

Glyptelasma hamatum (Calman, 1919)

Megalasma (*Glyptelasma*) *hamatum* Calman, 1919: 370, figs 5-7. – Nilsson-Cantell 1927: 770, fig. 12; 1928: 23, fig. 11; 1931: 10; 1934: 49; 1955: 219. – Weisbord 1979: 48, pl.5, figs 1-2, pl. 14, fig. 3. – Zevina 1982: 93, fig. 83.

Megalasma hamatum – Zevina 1969: 67; 1976: 1155.

MATERIAL EXAMINED. — Stn 180, 1 specimen, tl: 0.8 cm, MNHN Ci 2666. — Stn 202, 16 specimens, tl: 0.9-2.5 cm, MNHN Ci 2613, MNRJ 8872. — Stn 227, 1 specimen, tl: 1.8 cm, MNHN Ci 2624.

REMARKS

Glyptelasma hamatum is defined by the pair of short, hook-like processes on the prosoma and by the filamentary appendage at the base of cirrus I.

This species has a circumtropical distribution, occurring between depths of 457 and 3778 m (Weisbord 1979) and was recorded previously in the Eastern Atlantic from the Cape Verde Islands (Calman 1919) and off Sierra Leone (Nilsson-Cantell 1927; Fig. 1).

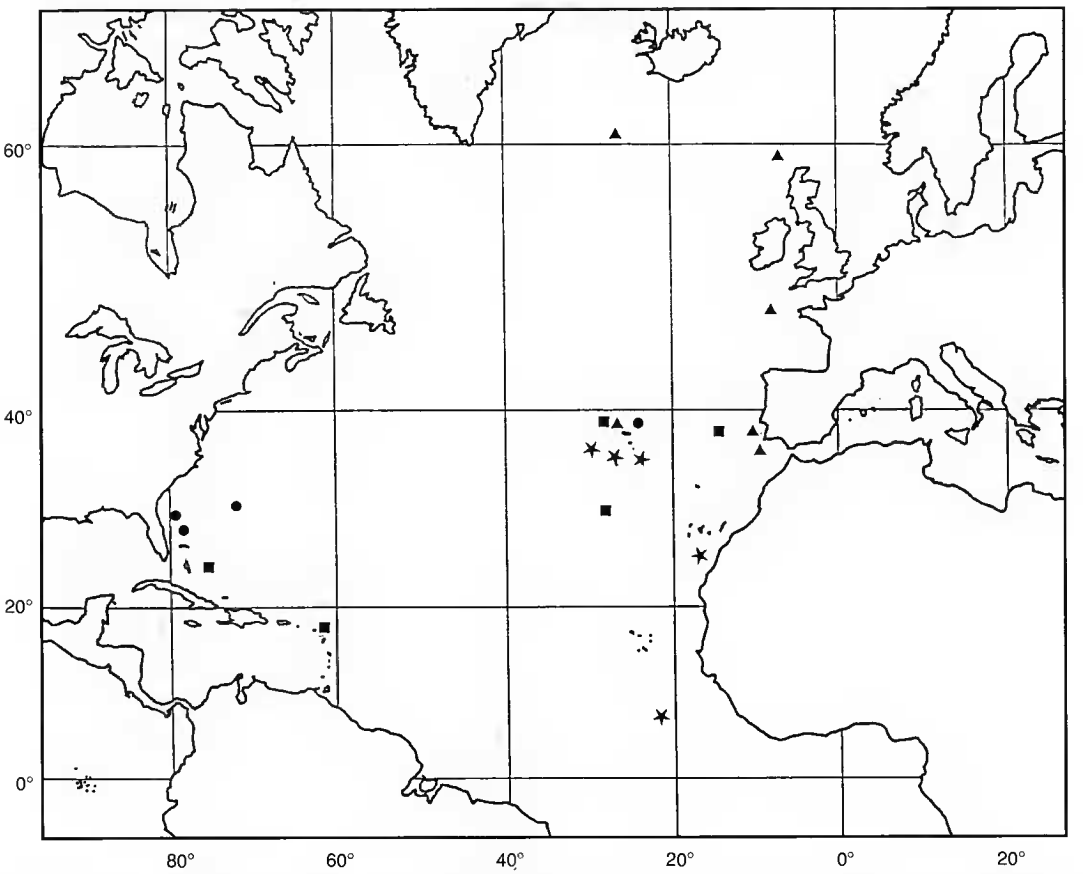

FIG. 1. — Geographic distribution of *Oxynaspis patens* Aurivillius (■), *Glyptelasma hamatum* Calman (★), *Arcoscalpellum tritonis* (Hoek) (▲) and *Hexelasma americanum* (Pilsbry) (●).

Family LEPADIDAE Darwin, 1852
Genus *Lepas* Linnaeus, 1758

Lepas anatifera Linnaeus, 1758

Lepas anatifera Linnaeus, 1758: 668. – Darwin 1852: 73, pl. 1, fig. 1, 1a-c. – Pilsbry 1907a: 79, pl. 9, figs 3-5.

Lepas (*Anatifa*) *anatifera* – Zevina 1981: 17, fig. 8.

MATERIAL EXAMINED. — Stn L7, 10 specimens, tl: 0.9-2.5 cm, MNHN Ci 2539.

REMARKS
Lepas anatifera is a species commonly found attached to floating objects (Pilsbry 1907a; Weisbord 1979).

Lepas pectinata Spengler, 1792

Lepas pectinata Spengler, 1792: 106, pl. 10, fig. B, 2a-c. – Darwin 1852: 85, pl. 1, figs 3, 3a. – Pilsbry 1907a: 81, pl. 8, figs 4-6, 8.

Lepas (*Anatifa*) *pectinata* – Zevina 1981: 15, fig. 6.

MATERIAL EXAMINED. — Stn L7, 7 specimens, tl: up to 1.0 cm, MNHN Ci 2540. — Stn 120, 16 specimens, tl: up to 0.6 cm, MNHN Ci 2565. — Stn 131, more than 100 specimens, up to 0.7 cm, MNHN Ci 2569, MNRJ 8873.

REMARKS
Lepas pectinata is a species commonly found attached to floating objects, including floating detached algae (Pilsbry 1907a; Weisbord 1979). The specimens, from depths of 2100 and 2120 m, clearly represent situations where detached algae (*Sargassum*) sank to this depth or were erroneously picked up during dredging work, since *L. pectinata* and *Sargassum* do not live at these depths.

Genus *Conchoderma* Olfers, 1814

Conchoderma auritum (Linnaeus, 1767)

Lepas aurita Linnaeus, 1767: 1110.

Conchoderma auritum – Darwin 1852: 141, pl. 3, figs 4, 4a-c. – Pilsbry 1907a: 99, pl. 9, fig. 2. – Zevina 1981: 26, fig. 15.

MATERIAL EXAMINED. — Ponta Delgada, 3 specimens, tl: 1.3-2.0 cm, MNHN Ci 2656.

REMARKS
Conchoderma auritum is commonly found on whales and ships, and also on turtles (Pilsbry 1907a; Weisbord 1979). The specimens from "Ponta Delgada" were collected attached to the hull of N. O. *Jean Charcot*.

Suborder SCALPELLOMORPHA
Newman, 1987
Family CALANTICIDAE Zevina, 1978
Genus *Smilium* Gray, 1825

Smilium acutum (Hoek, 1883)

Scalpellum acutum Hoek, 1883: 80, pl. 3, fig. 19; pl. 8, fig. 12; 1907a: 64, pl. 7, fig. 1. – Gruvel 1920: 12, pl. 2, fig. 7.

Smilium acutum – Newman & Ross 1971: 38, textfig. 12, pl. 5F (synonymy). – Foster & Buckeridge 1995a: 166, fig. 1c.

MATERIAL EXAMINED. — Stn 179, 4 specimens, tl: 0.4-1.3 cm, MNHN Ci 2593, MNRJ 8874.

REMARKS
Smilium acutum is a world-wide species (Newman & Ross 1971). In the Eastern Atlantic it has been recorded from the West European Basin, off Morocco, Cape Verde, Madeira, and also the Azores (Hoek 1883; Calman 1918; Gruvel 1920; Foster & Buckeridge 1995a; Fig. 2).

Family SCALPELLIDAE Pilsbry, 1907a
Subfamily SCALPELLINAE Pilsbry, 1907a
Genus *Scalpellum* Leach, 1817

Scalpellum scalpellum Linnaeus, 1767

Lepas scalpellum Linnaeus, 1767: 1109.

Scalpellum scalpellum – Darwin 1852: 222, pl. 5, fig. 15. – Pilsbry 1907a: 16. – Nilsson-Cantell 1978: 16, figs 6-7. – Zevina 1981: 94, fig. 65.

MATERIAL EXAMINED. — Stn 260, 27 specimens, tl: up to 1.7 cm, MNHN Ci 2654, MNRJ 8875.

REMARKS
Scalpellum scalpellum is a common species along the European and North African coasts. It ranges from depths of 10 to 540 m, but occurs more commonly between 30 and 200 m (Nilsson-Cantell 1978).

Subfamily MEROSCALPELLINAE Zevina, 1978
Genus *Neoscalpellum* Newman *et* Ross, 1971

Neoscalpellum debile (Aurivillius, 1898)

Scalpellum debile Aurivillius, 1898: 189. – Gruvel 1905: 27; 1920: 31, pl. 5, figs 13-15, pl. 7, fig. 1.

Scalpellum edwardsii Gruvel, 1900a: 189; 1902a: 63, pl. 2, figs 3B, 16; 1905: 28, fig. 27.

Scalpellum dicheloplax Pilsbry, 1907a: 70, fig. 28a-c. – Hoek 1914: 4.

Scalpellum dicheloplax benthophila Pilsbry, 1907a: 73, fig. 28d.

Scalpellum alboranense Gruvel, 1920: 33, pl. 5, figs 4-6.

Neoscalpellum debile – Newman & Ross 1971: 96, figs 49-50.

MATERIAL EXAMINED. — Stn 131, 3 specimens, tl: 1.0-1.1 cm, MNHN Ci 2568. — Stn 202, 1 specimen, tl: 0.8 cm, MNHN Ci 2614. — Stn 245, 2 specimens, tl: 0.6-1.2 cm, MNHN Ci 2708. — Stn 249, 2 specimens, tl: 0.8-2.3 cm, MNHN Ci 2642. — Stn 250, 1 specimen, tl: 3.3 cm, MNHN Ci 2646.

REMARKS
Neoscalpellum debile was discussed by Newman & Ross (1971: 96) and Young (in press). It has a North Atlantic distribution, with several records from the Azores Region (disrribution map in Young, in press).

Subfamily ARCOSCALPELLINAE Zevina, 1978
Genus *Arcoscalpellum* Hoek, 1907a

Arcoscalpellum michelottianum
(Seguenza, 1876)

Scalpellum michelottianum Seguenza, 1876: 381, pl. 6, figs 15-25, pl. 10, fig. 26.

Scalpellum velutinum Hoek, 1883: 96, pl. 4, figs 10-11, pl. 9, figs 7-9.

Arcoscalpellum michelottianum – Newman & Ross 1971: 71, textfig. 34, pl. 9b (synonymy).

MATERIAL EXAMINED. — Stn 105, 1550 m, 1 specimen, tl: 1.3 cm, MNHN Ci 2564. — Stn 180, 10 specimens, tl: 1.2-4.0 cm, MNHN Ci 2594, MNRJ 8876. — Stn 196, 6 specimens, tl: 1.9-3.1 cm, MNHN Ci 2606, MNRJ 8877.

REMARKS
This is one of the most common deep sea species. It occurs world-wide, and there are several records from the Eastern Atlantic (distribution map in Young, in press) (Hoek 1883; Gruvel 1902a, 1905, 1920; Nilsson-Cantell 1928).

Arcoscalpellum tritonis (Hoek, 1883)
(Fig. 1)

Scalpellum tritonis Hoek, 1883: 122, pl. 5, figs 9-10, pl. 10, fig. 10; 1884: 4. – Pilsbry 1907a: 34. – Broch 1953: 4.

Arcoscalpellum tritonis – Newman & Ross 1971: 60. – Zevina 1978: 1350; 1981: 342, fig. 342.

MATERIAL EXAMINED. — Stn 66, 2 specimens, tl: 1.6-1.7 cm, MNHN Ci 2663. — Stn 251, 1 specimen, tl: 1.4 cm, MNHN Ci 2649.

REMARKS
The are no noteworthy differences between these specimens and those from *Siboga* and from *Meteor* (Hoek 1883; Young in press), except the relative length and development of the inframedian latus, which is more variable. The specimens from the *Meteor* have the inframedian latus a little higher than wide with the height almost twice width in some specimens.

Arcoscalpellum eponkos n.sp.
(Figs 3-4)

MATERIAL EXAMINED. — Holotype: stn 249, tl: 0.9 cm, MNHN Ci 2643. Paratypes: 2 specimens from the same locality, tl: 0.4 and 0.6 cm, MNHN Ci 2669.

ETYMOLOGY. — From the Greek, *eponkos* (pregnant) in reference to the inflated scutum.

DIAGNOSIS
Plates of capitulum approximate, thin, smooth,

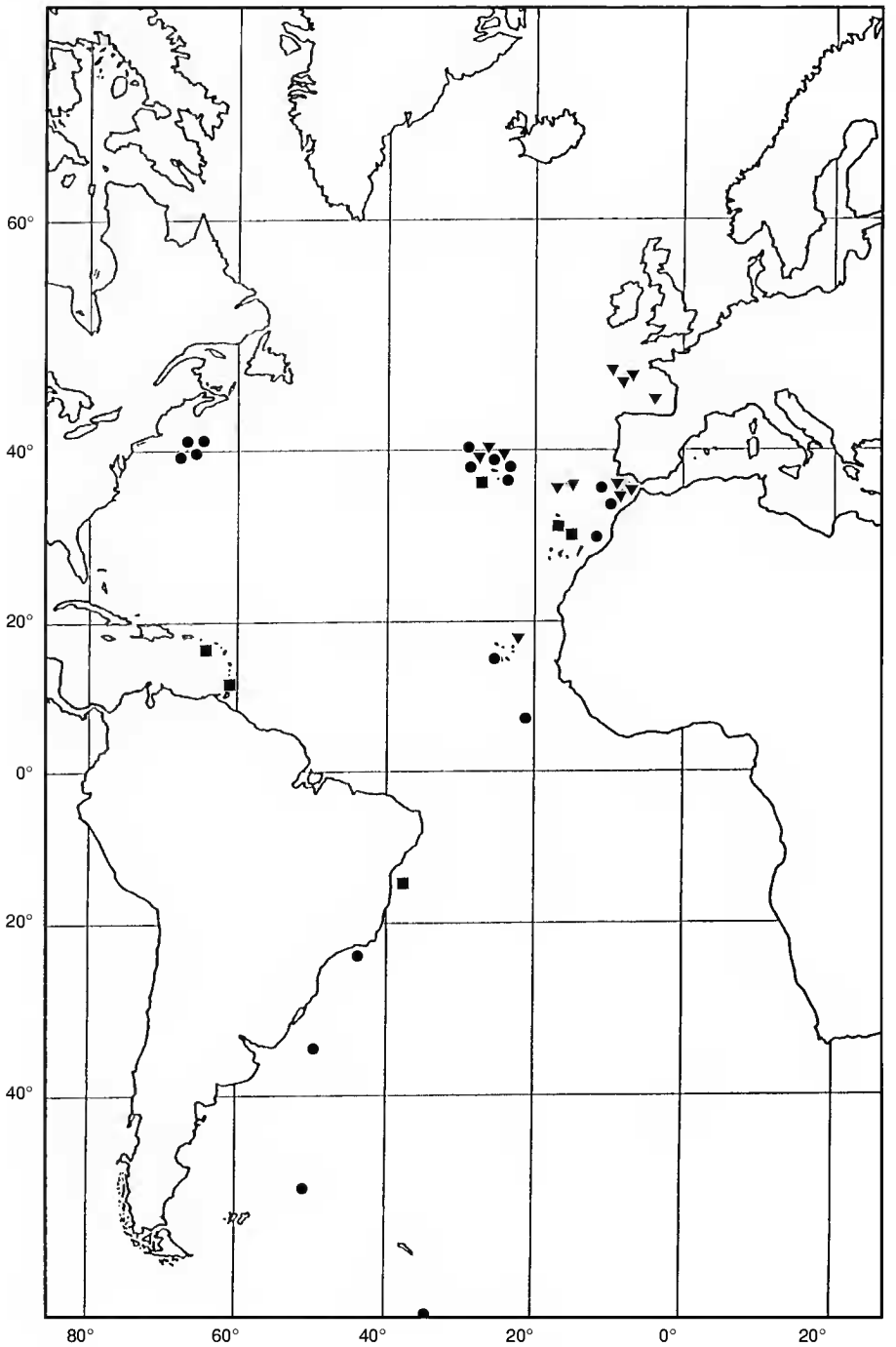

FIG. 2. — Geographic distribution of *Oxynaspis celata* group (■) (in the Western Atlantic, *O. hirtae* Totton and in the Eastern Atlantic, *O. celata* Darwin *s.s.*), *Smilium acutum* (Hoek) (▼) and *Altiverruca gibbosa* (Hoek) (●).

except for strong longitudinal ridges at basi-lateral surface of carino-latus. Scutum conspicuously inflated at basi-occludent area, with strong tetgal arm. Caudal appendage uniarticulated.

DESCRIPTION

Female

Capitulum (Fig. 3A-D) covered by thin hairless cuticle; length about twice width, capitulum laterally compressed except for convex enlargement in scuta; carinal margin more convex than occludent margin. Plates thin, smooth, except for strong longitudinal ridges at basi-lateral area of carino-latus and thin sparse growth lines. Plates approximate.

Scutum (Fig. 3A-B) conspicuously inflated in basi-occludent area, pronounced tergal arm approximately one quarter length of tergal margin, shallow groove near the apex of upper-latus; length twice width; all margins convex, except for concavity at upper portion of lateral margin; apex recurved, extending over tergum.

Tergum (Fig. 3A) triangular, apex conspicuously recurved towards carina; basal margin almost straight, occludent margin convex; surface area larger than that of scutum.

Carina (Fig. 3A, C) regularly arched, uniformly broad, rectum flat, basal portion triangular.

Upper-latus (Fig. 3A) quadrangulat; scutal margin longer than tergal; scutal margin concave, others almost straight; carino-lateral more than twice width of carinal margin.

Carino-latus (Fig. 3A, C) pentagonal, height more than twice width, umbo near base of catina, projecting slightly beyond carinal outline; basi-lateral area with strong radial ridges. Plates contiguous under carina, interdigitating.

Inframedian latus (Fig. 3A) triangular, not projecting, apex at same height as upper-latus height; height three times greater than width, bordered by low elevated ridge.

Rostro-latus (Fig. 3A, D) higher than wide; basal and scutal margins diverging, latter larger, with slight apico-basal ridge separating plate into two triangulat areas.

Rostrum (Fig. 3D) elongated, almost two third length of tostro-latus margin, thin, rounded at top.

Peduncle (Fig. 3A) short, length approximately one fifth that of capitulum, covered by conspicuous laterally elongated scales.

Labrum (Fig. 3E) with single row of thirty-six small teeth. Palp (Fig. 3E) small, distally acuminate, with sparse setae on all surfaces. Mandible (Fig. 3F) with three teeth, lower angle denticulated; distance between first and second tooth two third that between second and third. Maxilla I (Fig. 3G) with two steps, lower one ptojecting; upper angle with two large and two smaller spines, eight intermediate small spines directed basally along cutting border below. Maxilla II (Fig. 3H) bilobed, with simple setae along margins; maxillary gland not projecting.

Cirrus I (Fig. 3I) with anterior ramus 0.70 length of posterior one; lesset tamus with articles slightly proruberant, clothed with numerous, simple setae. Cirri II-VI with subequal to equal rami; intermediate articles of cirrus VI (Fig. 3J) 2.5 times as long as wide, armed with three pairs of simple setae and scattered small setae on anterior margin, one to two setae on postetior angle.

Caudal appendage (Fig. 3K) uniarticulated, short, about one fifth height of coxopodite, with few simple setae at apex. Number of articles of cirri I-VI and caudal appendage is presented in table 1.

TABLE 1. — Number of articles of cirri I-VI, and caudal appendage of *Arcoscalpellum eponkos* n.sp. Holotype, stn 249. **I-VI**, cirri I to VI; **CA**, caudal appendage; **RC**, right cirri; **LC**, left cirri; +, broken ramus.

	I	II	III	IV	V	VI	CA
RC	7/9	15/16	18/18	19+/20	23/21	21/20	1
LC	6/10	15/17	18/19	21/21	20/21	22/22	1

REMARKS

Arcoscalpellum eponkos n.sp. is a small species, the largest specimen reaching 9 mm in overall height. The characteristic inflated scutum with a tergal arm, longitudinal ridges restricted to the basi-lateral surface of the carino-lateral, and the uniarticulated caudal appendage distinguish this species from all other species of *Arcoscalpellum* s.str. Small specimens do not have the inflated scutum, but the other characteristics are already well developed.

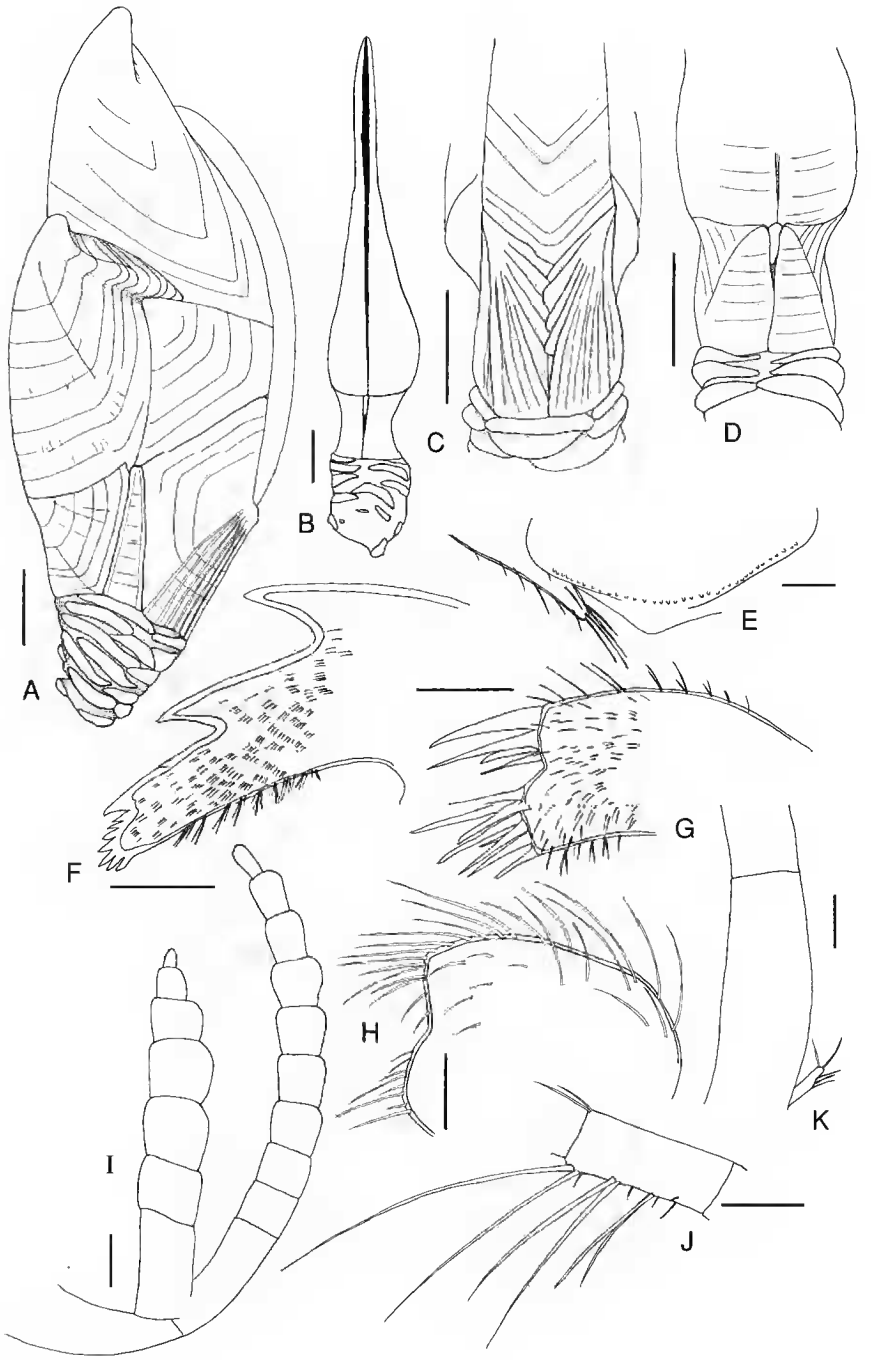

FIG. 3. — *Arcoscalpellum eponkos* n.sp. Holotype: **A**, **B**, lateral and rostral views; **C**, carinal view of the carino-lateral and base of carina; **D**, rostral view of rostro-lateral and rostrum; **E**, labrum and palp; **F**, mandible; **G**, maxilla I; **H**, maxilla II; **I**, outline of cirrus I; **J**, intermediate article of cirrus VI; **K**, caudal appendage. Scale bars: A-D, 1 mm; E-H, 0.1 mm; I-K, 0.2 mm.

The lengthened inframedian latus and the high carino-latus suggests that this species is closely related to *A. radiattum* Rao *et* Newman, *A. gryllum* Zevina, *A. compositum* (Zevina), *A. galapaganum* (Pilsbry) and *A. sculptum* (Hoek). However, none of these species have a tergal arm on the scutum, except for the *A. sculptum*, which has a poorly developed arm. *A. sculptum* also has strongly ridged plates.

Arcoscalpellum eponkos n.sp. is known only from the type-locality, West European Basin, between depths of 4620-4690m (Fig. 4).

Genus *Planoscalpellum* Zevina, 1978

Planoscalpellum limpidus (Zevina, 1976)

Scalpellum limpidus Zevina, 1976: 1152, fig. 2.

Planoscalpellum limpidus – Zevina 1978: 1347; 1981: 187, fig. 131; 1993a: 125.

MATERIAL EXAMINED. — Stn 245, 1 specimen, tl: 1.0 cm, MNHN Ci 2640. — Stn 249, 1 specimen, tl: 1.0 cm, MNHN Ci 2645.

REMARKS

Planoscalpellum limpidus occurs at depths between 5001-5580 m. It was recorded originally from the Azores (Zevina 1976) and later in the Antarctic (Zevina 1993a) and Iberian Basin (Young in press). The present new records extend the northern distribution to 45°50'N and indicate a shallower depth of 4270 m. *P. limpidus* is redescribed and discussed in detail by Young (in press).

Genus *Catherinum* Zevina, 1978

Catherinum recurvitergum (Gruvel, 1900a) (Figs 4-5)

Scalpellum recurvitergum Gruvel, 1900a: 190; 1902a: 67, pl. 2, figs 3h, 21-22; 1902c: 523; 1905: 49, fig. 54. – Weltner 1922: 72. – Nilsson-Cantell 1938: 8; 1955: 218. – Zevina 1976: 1155.

Catherinum recurvitergum – Zevina 1978: 1348; 1981: 245, fig. 181.

MATERIAL EXAMINED. — Stn 202, 1 specimen and 1 scutum, tl: 1.6 cm, MNHN Ci 2616. — Stn 245, 3 specimens, tl: 1.1-1.3 cm, MNHN Ci 2641, MNRJ 8878.

DESCRIPTION

Female

Capitulum (Fig. 5A-C) covered by thin hairless cuticle; length twice its width, width uniform; carinal and occludent margins convex, with same curvature. Plates with thin, sparse growth lines, with longitudinal ridges variously developed, ridges absent in specimens up to 10 mm in length, slightly elevated in specimens of about 13 mm, conspicuous and strong in specimens of 15 mm. Plates approximate, cuticle separating carina from other plates.

Scutum (Fig. 5A) with occludent margin convex, with shallow groove near apex of upper-latus; scutal length twice width; tergal arm small, about one fifth length of tergal margin; tergal margin equal to length of basal margin, with small upper rim; carinal and occludent margins convex, except for concavity at upper portion of former; apex curved, extending slightly over tergum.

Tergum (Fig. 5A) triangular, with longitudinal ridges more developed at occludent area; basal margin almost straight, occludent margin convex, carinal irregular; apex recurved in small specimens, acute or eroded and obtuse in large specimens, slightly recurved toward carina; surface area of tergum equal to that of scutum.

Carina (Fig. 5A, B) regularly arched, broader apicaly, tectum slightly concave, bordered by two low longitudinal ribs, basal portion rounded.

Upper-latus (Fig. 5A) pentagonal. Length of scutal margin greater than tergal one, former concave. All other margins essentially straight, carino-lateral longest, followed in size by tergal and inframedian margins. Apex with small upper rim.

Rostro-latus (Fig. 5A, C) wider than high; basal and scutal margins diverging, scutal margin greater in length than basal margin, apico-basal ridge separating plate into two triangular surfaces.

Carino-latus (Fig. 5A, B) pentagonal, higher than wide, umbo near base of carina, umbo projecting slightly beyond carinal margin. Plates contiguous under carina.

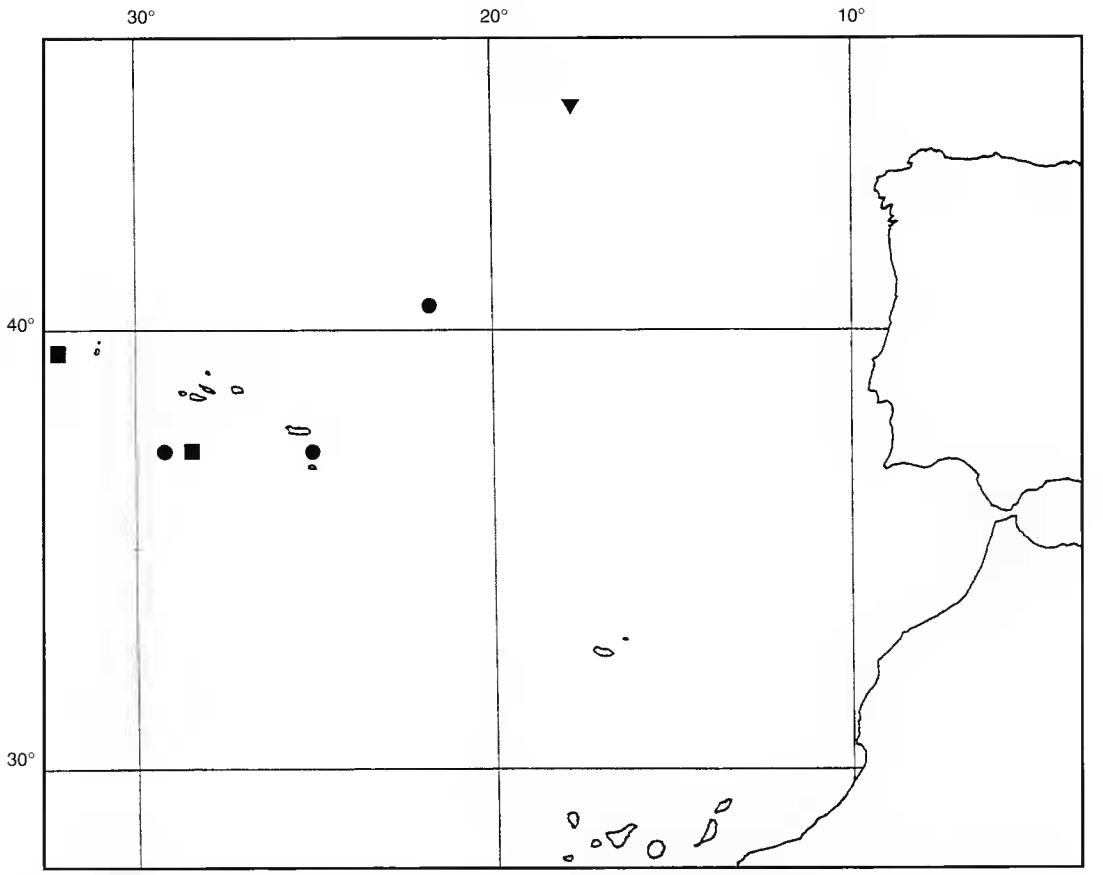

FIG. 4. — Geographic distribution of *Arcoscalpellum eponkos* n.sp. (▼), *Catherinum recurvitergum* (Gruvel) (●) and *Teloscalpellum luteum* (Gruvel) (■).

Inframedian latus (Fig. 5A) vase-shaped, umbo subcentral, apical portion higher and wider than basal portion.

Rostrum (Fig. 5C) elongate; length almost two third that of rostro-latus margin; thin, apically rounded.

Peduncle (Fig. 5A) about one quarter length of capitulum, covered by conspicuous lengthened scales.

Labrum (Fig. 5D) with row of forty-four small teeth. Palp (Fig. 5D) small, paddle-like, with setae on all surfaces.

Mandible (Fig. 5E) with three teeth, lower angle denticulated; distance between first and second teeth less than twice that between second and third one.

Maxilla I (Fig. 5F) with straight border, two large and thick spines at upper angle, nine moderate to small spines directed downwards below.

Maxilla II (Fig. 5G) triangular with finely pinnate setae along margins; maxillary gland projecting prominently.

Cirrus I (Fig. 5H) with shorter ramus 0.75 length of longer; articles little protuberant, clothed with numerous simple setae.

Cirri II-VI with subequal to equal rami, interme-

diare articles of cirrus VI (Fig. 5I, J) twice as long as wide, wirh three or four pairs of simple setae and scartered small serae on anterior margin, pairs of serae more developed along rhe posterior ramus; one to rwo setae on posterior angle. Caudal appendage (Fig. 5K) multiarticulated (7-8), almost twice length of protopod, simple setae at distal point, a few setae on distal margins of articles.

Number of articles of cirri I-VI and caudal appendage is presented in table 2.

TABLE 2. — Number of articles of cirri I-VI, and caudal appendage of *Catherinum recurvitergum* (Gruvel), stn 202. **I-VI**, cirri I to VI; **CA**, caudal appendage; **RC**, right cirri; **LC**, left cirri; **+**, broken ramus.

	I	II	III	IV	V	VI	CA
RC	8/10	17/19	14+/15+	22/14+	22/23	23/16+	8
LC	8/10	16/16+	20/22	12+/23	15+/22	23/23	7

REMARKS

The specimen described by Gruvel (1902a) is 11 mm in capitulum lengrh and was illustrated wirhout longitudinal ridges. However, in his description Gruvel stated that the plates had conspicuous radial lines.

The present specimens examined range from 10 to 16 mm in capitulum lengrh, and it is apparent that the development of the longitudinal ridges increases during ontogeny.

The smallest specimen (10 mm) has only a few longitudinal ridges on the plates and the largest (16 mm) has such ridges on all plates except for the carina (Fig. 5A). Otherwise, the apex of the recurved tergum noted by Gruvel (1902a) is not as recurved in the specimens examined.

Catherinum recurvitergum was originally described from rhe Azores from 3175 m (Gruvel 1900a; 1902a) and subsequenrly only recorded from eastern Africa from 1289 m (Weltner 1922). Welrner did not describe or figure his specimens. The specimens sampled are from the type locality, Azores region (Fig. 4), between 2900 and 4270 m, which extends the depth range of this species.

Genus *Amigdoscalpellum* Zevina, 1978

Amigdoscalpellum rigidum (Aurivillius, 1898)

Scalpellum rigidum Aurivillius, 1898: 189. – Gruvel 1905: 86. – Zevina 1976: 1155.

Scalpellum striatum Gruvel, 1900a: 191; 1902a: 77, pl. 2, fig. 3I; 1905: 72, fig. 81; 1920: 23, pl. 2, figs 4-6, 9-11; pl. 7, fig. 11. – Nilsson-Cantell 1955: 219. – Belloc 1959: 3.

Amigdoscalpellum rigidum – Zevina 1978: 1349; 1981: 277, fig. 209.

MATERIAL EXAMINED. — Stn 174, 2 specimens, tl: 2.0 and 2.1 cm, MNHN Ci 2590. — Stn 176, 1 specimen, tl: 2.7 cm, MNHN Ci 2592. — Stn 202, 17 specimens, tl: 1.5-3.7 cm, MNHN Ci 2615, MNRJ 8879. — Stn 206, 1 specimen, tl: 2.5 cm, MNHN Ci 2618. — Stn 227, 1 specimen, tl: 4.0 cm, MNHN Ci 2625. — Stn 245, 1 specimen, tl: 2.6 cm, MNHN Ci 2637. — Stn 251, 2 specimens, tl: 2.1-2.4 cm, MNHN Ci 2647.

REMARKS

Amigdoscalpellum rigidum appears to be a common deep-sea species from the Azores, Cape Verde, and the Iberian Basin, occurring between depths of 1267-4400 m (Aurivillius 1898; Gruvel 1905; Young in press). It was also recorded once from the Newfoundland Basin, from 1267 m (Aurivillius 1898). The new samples extend its distribution to the West European Basin. *A. rigidum* is redescribed and discussed by Young (in press).

Genus *Trianguloscalpellum* Zevina, 1978

Trianguloscalpellum ovale (Hoek, 1883)

Scalpellum regium var. *ovale* Hoek, 1883: 109, pl. 5, figs 5-6.

Trianguloscalpellum regium ovale – Zevina 1981: 311, fig. 235.

MATERIAL EXAMINED. — Stn 249, 2 specimens, tl: 3.3 and 4.9 cm, MNHN Ci 2644.

REMARKS

T. ovale is redescribed and discussed in detail by Young (in press) who presents a key for the related species. This new sample does not add any

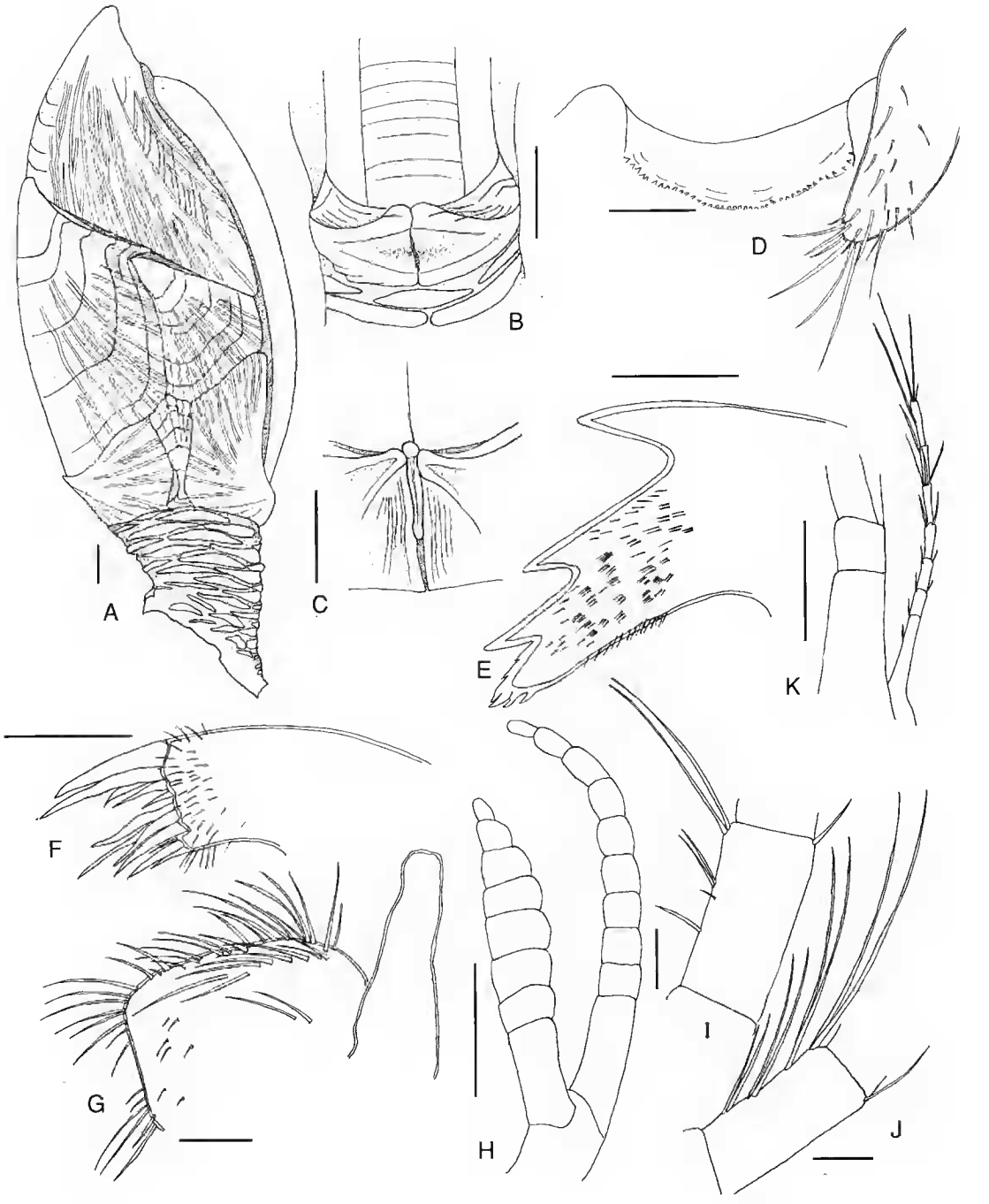

FIG. 5. — *Catherinum recurvitergum* (Gruvel). **A**, lateral view; **B**, carinal view; **C**, rostral view; **D**, labrum and palp; **E**, mandible; **F**, maxilla I; **G**, maxilla II; **H**, outline of cirrus I; **I**, **J**, intermediate article of anterior and posterior rami of cirrus VI; **K**, caudal appendage. Scale bars: A-C, H, K, 1 mm; D-G, I-J, 0.2 mm.

information about the North Atlantic deep sea distribution of this species.

Trianguloscalpellum regium (Thomson, 1873)

Scalpellum regium Thomson, 1873: 347 (part); 1877: 4 (part). – Hoek 1883: 106, pl. 4, figs 3-5, pl. 9, fig. 12, pl. 10, figs 1-2; 1884: 10. – Pilsbry 1907a: 28, pl. 3, fig. 5 (part). – Gruvel 1912a: 2; 1920: 30, pl. 1, fig. 7.

Scalpellum molle Aurivillius, 1898: 191. – Gruvel 1905: 76; 1920:29, pl. 5, figs 10-12. – Nilsson-Cantell 1955: 218. – Zevina 1976: 1155; 1981: 309.

Trianguloscalpellum regium – Zevina 1978: 1350. – Foster & Buckeridge 1995a: 167, figs 2A-D, 3.

Trianguloscalpellum regium regium – Zevina 1981: 309, fig. 234.

MATERIAL EXAMINED. — Stn 129, 3 specimens, tl: 1.3-4.3 cm, MNHN Ci 2566. — Stn 202, 27 specimens, tl: up to 6.4 cm, MNHN Ci 2617, MNRJ 8880. — Stn 245, 9 specimens, tl: 0.4-7.0 cm, MNHN Ci 2638. — Stn 251, 3 specimens, tl: 1.7-5.4 cm, MNHN Ci 2648.

REMARKS

In the smaller specimens the upper flange of the carino-latus does not appear to be as well developed as in the larger specimens described by Young (in press). The roof of the carina changes in shape from flat with a central elevation in smaller specimens to flat with lateral ridges in larger ones.

T. regium is redescribed in detail and discussed by Young (in press). The present samples do not add new information regarding its North Atlantic deep-sea distribution.

Genus *Teloscalpellum* Zevina, 1978

Teloscalpellum luteum (Gruvel, 1900a) (Figs 4, 6)

Scalpellum luteum Gruvel, 1900a: 192; 1902a: 80, pl. 2, fig. 11; 1905: 84, fig. 93. – Nilsson-Cantell 1955: 218. – Zevina 1976: 1155.

Teloscalpellum luteum – Zevina 1978: 1350; 1981: 363, fig. 280.

MATERIAL EXAMINED. — Stn 129, 1 specimen, tl: 3.0 cm, MNHN Ci 2567.

DESCRIPTION

Female

Capitulum (Fig. 6A, B) covered by thin hairless cuticle; length less than twice its width, breadth uniform; carinal margin more convex than occludent. Plates with strong longitudinal ridges and thin, sparse growth lines. Narrow cuticle separating most of plates.

Scutum (Fig. 6A) convex only at occludent area; height less than twice width; lateral margin longer than basal, sinuous; basal and occludent margins convex, tergal slightly concave; apex curved, extending over tergum.

Tergum (Fig. 6A) triangular, with longitudinal ridges developed only at occludent side; basal margin almost straight, occludent margin convex, carinal with depressed area near the carinal apex; apex obtuse, slightly turned toward carina; surface area greater than scutum.

Carina (Fig. 6A) regularly arched, tectum concave, bordered by high longitudinal rib, basal portion absent in specimen, therefore I could not observe its shape.

Upper-latus (Fig. 6A) pentagonal. Scutal and tergal margins equal in length, former concave. All other margins almost straight, carino-lateral longest, followed in size by tergal and inframedian margins. Umbo subapical. Apex thickened, forming upper ridged rim.

Rostro-latus (Fig. 6A, B) wider than high; basal and scutal margins parallel, latter longer; apices of plates overlapping.

Carino-latus (Fig. 6A) pentagonal, higher than wide, umbo near base of carina, not projecting from carinal outline. Plates contiguous under carina.

Inframedian latus (Fig. 6A) triangular, length twice its width, apex slightly turned anteriorly, with rim along carinal side.

Rostrum (Fig. 6B) absent.

Peduncle (Fig. 6A) about one half length of capitulum, covered by conspicuous lengthened scales and thick cuticle.

Labrum (Fig. 6C, D) with row of small teeth. Palp (Fig. 6C) small, acuminate, with few setae on upper margin and terminally. Mandible (Fig. 6E, F) with three teeth, with or without large tooth between first and second teeth, denticulated lower angle with few teeth; distance bet-

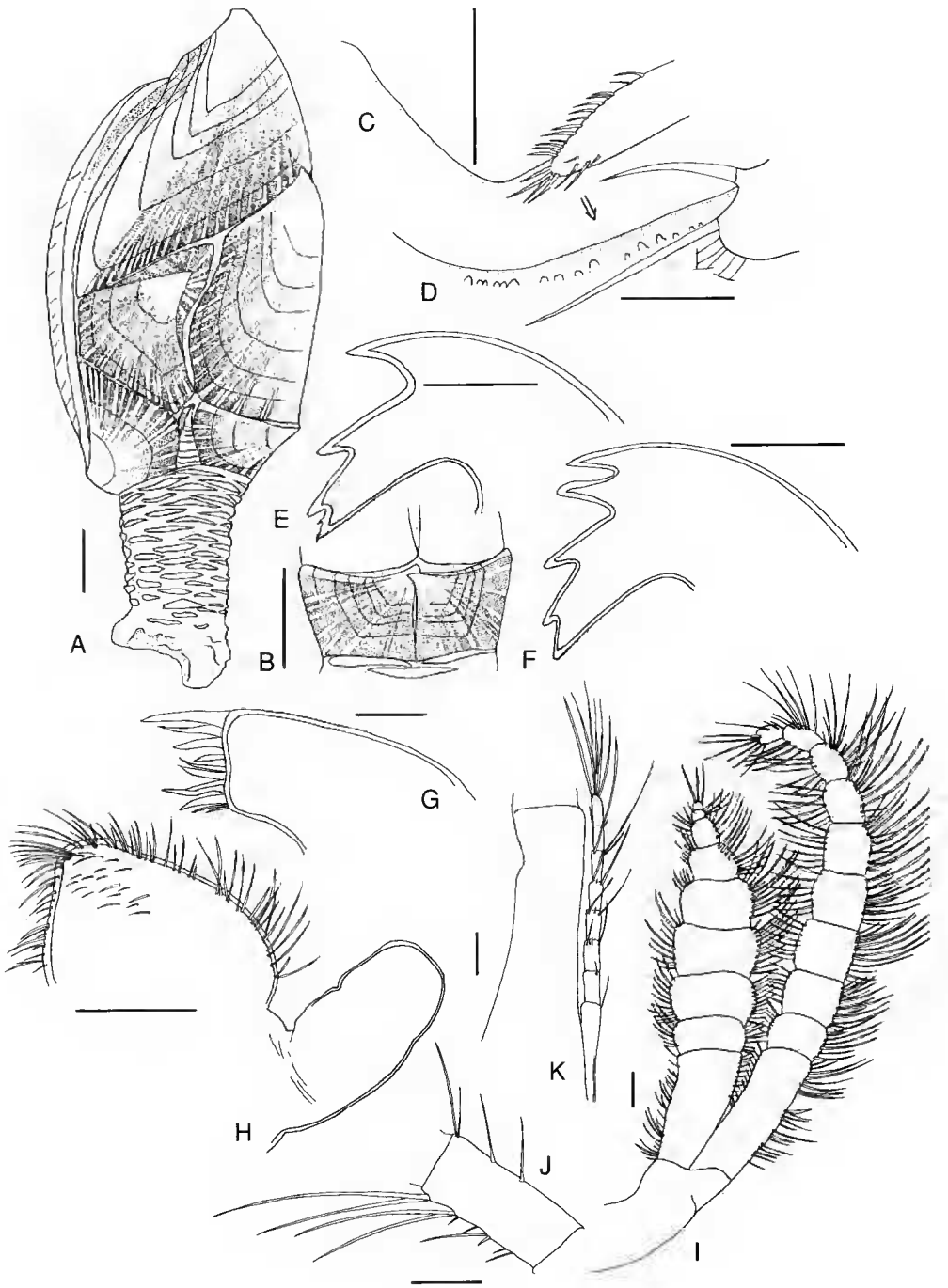

FIG. 6. — *Teloscalpellum luteum* (Gruvel). **A**, lateral view; **B**, carinal view; **C**, **D**, labrum and palp; **E**, **F**, mandibles; **G**, maxilla I; **H**, maxilla II; **I**, cirrus I; **J**, intermediate article of cirrus VI; **K**, caudal appendage. Scale bars: A-C, H, K, 1 mm; D-G, I, J, 0.2 mm.

ween first and second teeth twice distance between second and third one; setulation absent, only small scales on lower margin. Maxilla I (Fig. 6G) with straight anterior border or upper portion projecting slightly, with two large and thick spines at upper angle, nine to twelve moderate to small spines directed basally below. Maxilla II (Fig. 6H) nearly quadrangular with finely pinnate setae along margins; maxillary gland projecting prominently.

Cirrus I (Fig. 6I) with anterior ramus 0.65 of length of posterior one; articles of shorter ramus protuberant, both rami clothed with numerous simple setae. Cirri II-VI with equal rami, intermediate articles (Fig. 6J) about twice as long as wide, with three or four pairs of simple setae and scattered small setae on anterior margin, one to two setae on posterior angle, one or two simple setae on posterior margin. Caudal appendage (Fig. 6K) multiarticulated (8), slightly longer than protopod, with simple setae at distal point, few setae on distal margins of articles. Number of articles of cirri I-VI and caudal appendage is presented in table 3.

TABLE 3. — Number of articles of cirri I-VI, and caudal appendage of *Teloscalpellum luteum* (Gruvel), stn 129. **I-VI**, cirri I to VI; **CA**, caudal appendage; **RC**, right cirri; **LC**, left cirri; **+**, broken ramus.

	I	II	III	IV	V	VI	CA
RC	9/10	12+/20	22/22	28/30	30/31	33/28	8
LC	9/10	17/19	24/25	28/31	28/33	34/29	8

REMARKS

Teloscalpellum luteum (Gruvel) is known only by one specimen, capitular length 20 mm, from the type locality – Azores – at 3175 m (Gruvel 1900a, 1902a). Gruvel did not illustrate the longitudinal ridges of the plates, but did describe this character. These longitudinal ridges are conspicuous in the specimen studied.

The general shape of the capitular plates, especially the coronate upper-latus, agree with the description of Gruvel (1902a). The basal portion of the carina, where it meets the carinal latera, is absent in the specimen and, therefore, I could not observe the relationship of the carinal-latera.

T. luteum was collected in the same area as the type specimens (Azores), and from a similar depth (3056-3000 m; Fig. 4).

Order SESSILIA Lamarck, 1818
Suborder VERRUCOMORPHA Pilsbry, 1916
Family VERRUCIDAE Darwin, 1854
Genus *Altiverruca* Pilsbry, 1916

Altiverruca obliqua (Hoek, 1883)
(Figs 7-9)

Verruca obliqua Hoek, 1883: 143, pl. 12, figs 15-17. – Weltner 1897: 274. – Gruvel 1905: 173, fig. 191. – Hoek 1907b: 9.

Verruca obliqua, section D - *Altiverruca* – Pilsbry 1916: 40.

Altiverruca obliqua – Buckeridge 1994: 93.

Altiverruca vertica – Foster & Buckeridge 1995a: 180, fig. 14.

MATERIAL EXAMINED. — Stn 180, 1 specimen without eggs or larvae, rc: 0.6 cm, MNHN Ci 2595.

DESCRIPTION

Shell (Fig. 7A-C) white, smooth, growth lines widely spaced, not projecting. Opercular valves angularly placed, approximately 45° to basis (Fig. 7D). Base calcareous. Rostrum and carina (Fig. 7C) convex with apices projecting, latter higher; suture sinuose. Fixed-tergum (Fig. 7B) triangular, wider in middle, higher than fixed-scutum, with two well developed alate projections, little covered by radii-like projections of adjoining plates. Fixed-scutum (Fig. 7B) triangular, with well developed alate projection on to rostrum, covered by small radius-like projection of this plate; internally smooth.

Scutum smaller than tergum, basal margin one half length of tergum margin. Scutum (Fig. 7E) with two articular ridges, and flat upper triangular projection at occludent margin; axial ridge barely developed and curved; rostral area smooth. Internally, with deep depression for adductor muscle; occludent margin with small tooth at lower portion formed by second articular ridge. Tergum (Fig. 7F) quadrangular, with three articular ridges; axial ridge narrowest, intermediate

ridge broad, separated from upper ridge by conspicuous groove. Internally, surface slightly concave; occludent margin nearly straight, except for upper convex portion.

Labrum (Fig. 8A) with one series of forty teeth. Palp (Fig. 8A) long, few simple setae at upper margin and distal area. Mandible (Fig. 8B) with three teeth, distance between the first and second one twice that between the second and third one; lower angle denticulated. Maxilla I (Fig. 8C, D) straight or with the lower part projecting, with 10 to 13 unpaired spines. Maxilla II triangular, anterior margin concave medially, posterior margin convex; covered by long simple setae.

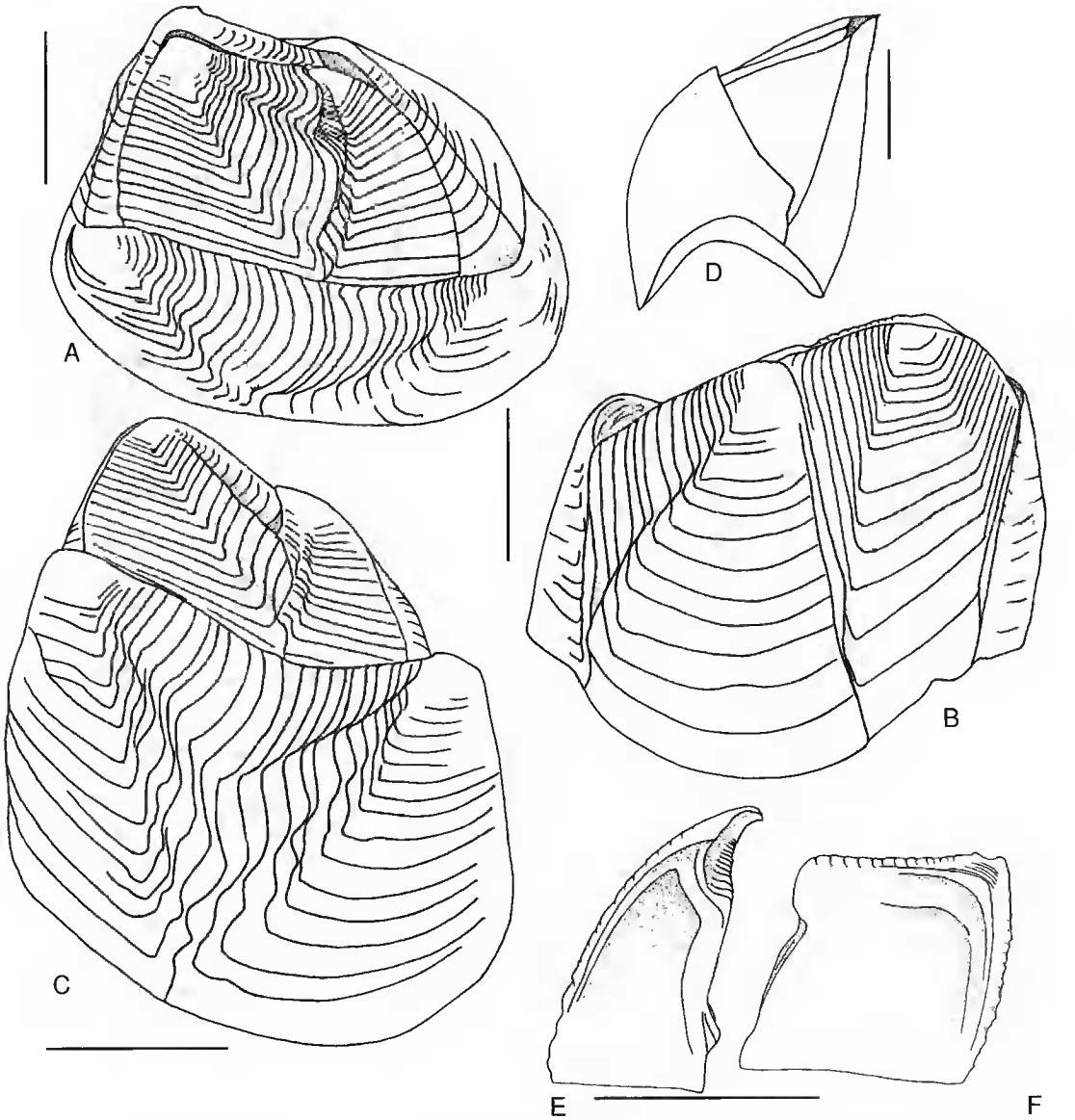

FIG. 7. — *Altiverruca obliqua* (Hoek). **A**, top view; **B**, carino-rostral view; **C**, fixed-tergum and fixed-scutum view; **D**, fixed-scutum and rostral view; **E**, **F**, tergum and scutum, internal view. Scale bars: 2 mm.

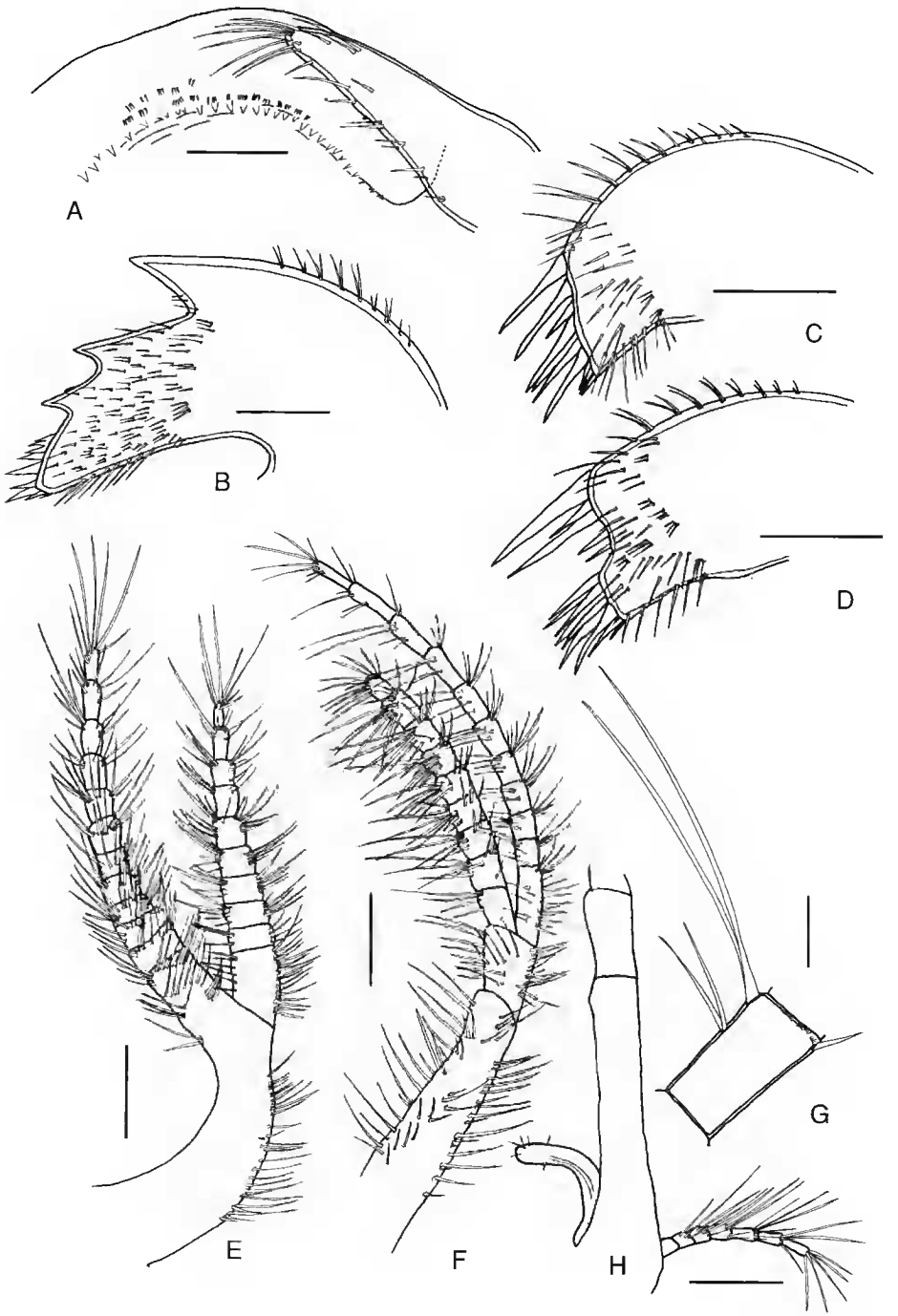

FIG. 8. — *Altiverruca obliqua* (Hoek). **A**, labrum and palp; **B**, mandible; **C**, **D**, maxillae I; **E**, cirrus I; **F**, cirrus II; **G**, intermediate article of cirrus VI; **H**, caudal appendage and penis. Scale bars: A-D, G, 0.1 mm; E, F, H, 0.3 mm.

Cirrus I (Fig. 8E) with anterior ramus a little longer than posterior, articles of both rami covered by numerous long, simple setae. Cirrus II (Fig. 8F) with unequal rami, anterior two third length of posterior, with protuberant articles; anterior ramus covered by numerous long, simple setae, posrerior with setation similar to articles of cirri III-VI. Cirrus III with subequal rami, cirri IV-VI with equal rami. Length of intermediate article of cirrus VI (Fig. 8G) twice width, with two pairs of simple setae on anterior margin, one or two short, stout setae on posterior angle, multifid scales at distal margins. Caudal appendage (Fig. 8H) multiarticulated, with six to seven articles, one half length of coxopodite. Penis (Fig. 8H) short with few setulae. Number of articles of cirri I-VI and caudal appendage is presented in table 4.

TABLE 4. — Number of articles of cirri I-VI, and caudal appendage of *Altiverruca obliqua* (Hoek), stn 180. **I-VI**, cirri I to VI; **CA**, caudal appendage; **RC**, right cirri; **LC**, left cirril.

	I	II	III	IV	V	VI	CA
RC	12/10	9/11	15/16	16/16	17/18	20/20	7
LC	10/10	8/9	13/13	17/17	17/19	19/20	6

REMARKS

Hoek (1883) described *A. obliqua* based on four small specimens collected off southwestern Spain at a depth of 2782 meters. This species has not been collected since.

This species was recently considered a synonym of *A. quadrangularis* (Hoek, 1883) by Foster & Buckeridge (1995b), but this conclusion seems to be premature. *Altiverruca quadrangularis*, first reported from the Southern Atlantic, is now

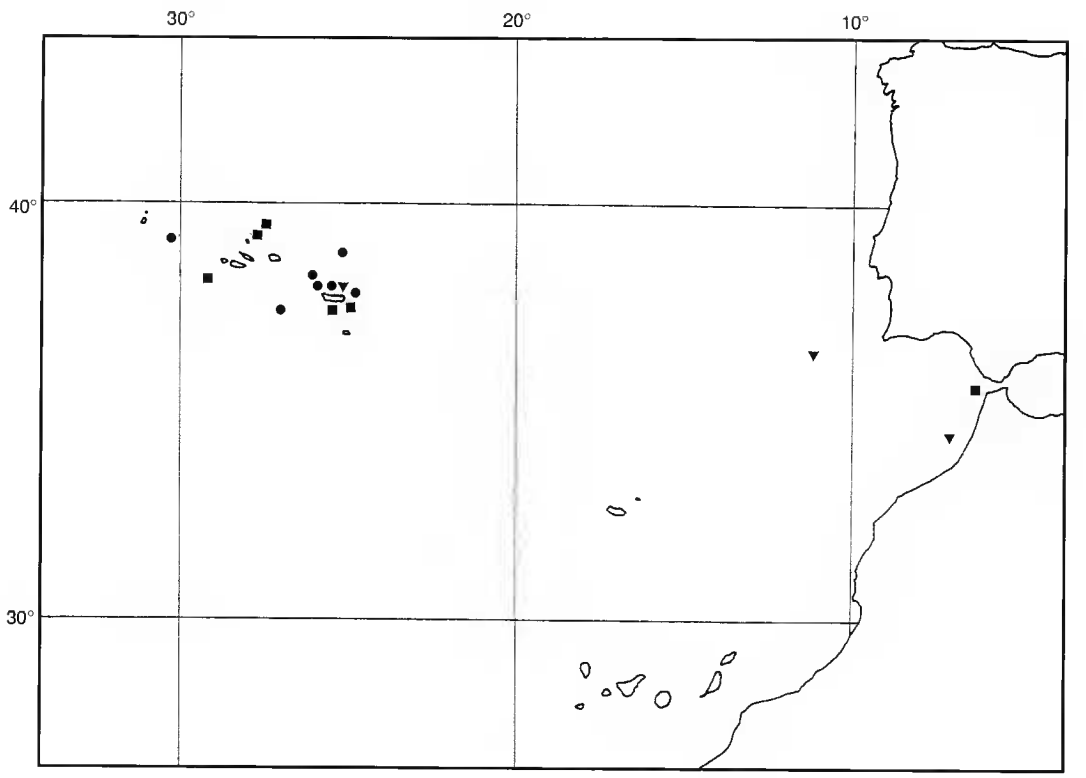

FIG. 9. — Geographic distribution of *Altiverruca obliqua* (Hoek) (▼), *Metaverruca aequalis* (Aurivillius) (●) and *Metaverruca trisulcata* (Gruvel) (■).

known from all the oceans (Lahille 1910; Gruvel 1920; Zevina 1988; Rosell 1989; Foster & Bucketidge 1995b).

Considering the original descriptions of both species, several characters distinguish them. Both have a tergum with three articular ridges, but *A. obliqua* has the intermediate ridge (second of Hoek) broad, leaving a thin groove between this ridge and the first one. Alternatively, *A. quadrangularis* has the second ridge narrow, with a very broad space separating it from the first ridge. The scutum of *A. obliqua* is proportionately narrower, its base one half the width of the base of tergum. In *A. quadrangularis* the movable scutum is significantly larger, with its width more than two third of the width of the base of the tergum. The axial ridge (third ridge of Hoek) is prominent in *A. quadrangularis*, but it is barely discernible in *A. obliqua*. Therefore, this synonymy cannot be accepted.

The single specimen I examined is older and hence more developed than the specimens Hoek studied. All of the differences I observed appear to be related to different stages of growth: the carina projects freely as does the scutum; the articulation between carina and rostrum has more than one single tooth.

Foster & Buckeridge (1995a) described *Altiverruca vertica* from the Straits of Gibraltar. Its opercular valves are identical to those examined here, differing only in the carina-rostrum suture. This suture is straighter than the one observed, but this may be due to ontogenetic differences. Furthermore, the relative length of the rami of cirri I-III and the caudal appendages are similar to the ones I observed. Hoek (1883) did not describe the appendages of *A. obliqua*.

The distribution of this species is restricted to the Northeastern Atlantic, between 34° to 37°N and 7° to 25°W (Fig. 9).

Altiverruca gibbosa (Hoek, 1883)
(Figs 2, 10)

Verruca gibbosa Hock, 1883: 134, pl. 6, figs 17, 18, pl. 11, figs 5-9, pl. 12, figs 1-5.

Verruca (*Altiverruca*) *gibbosa* – Newman & Ross 1971: 135, pl. 14, textfig. 68 (synonymy).

Altiverruca gibbosa – Zevina 1987a: 1813.

MATERIAL EXAMINED. — Stn 6, 1 empty shell, rc: 0.3 cm, MNHN Ci 2550. — Stn 159, 1 specimen, rc: 0.4 cm, MNHN Ci 2584. — Stn 180, 2 specimens, rc: 0.4-0.6 cm, MNHN Ci 2596, MNRJ 8903. — Stn 196, 1 specimen, rc: 0.5 cm, MNHN Ci 2603. — Stn 199, 1 specimen, rc: 0.5 cm, MNHN Ci 2610.

REMARKS

The specimens studied (Fig. 10A, B) do not present any differences from the specimens described by Hoek (1883).

A. gibbosa has a world-wide distribution and was previously recorded in the Eastern Atlantic from off the Straits of Gibraltar, Canaries and Cape Verde Islands and Sierra Leone Rise (Fig. 2) (Gruvel 1902a, as *V. sulcata*; Nilsson-Cantell 1927, as *V. rathbuniana*; Nilsson-Cantell 1928; Foster & Buckeridge 1995a).

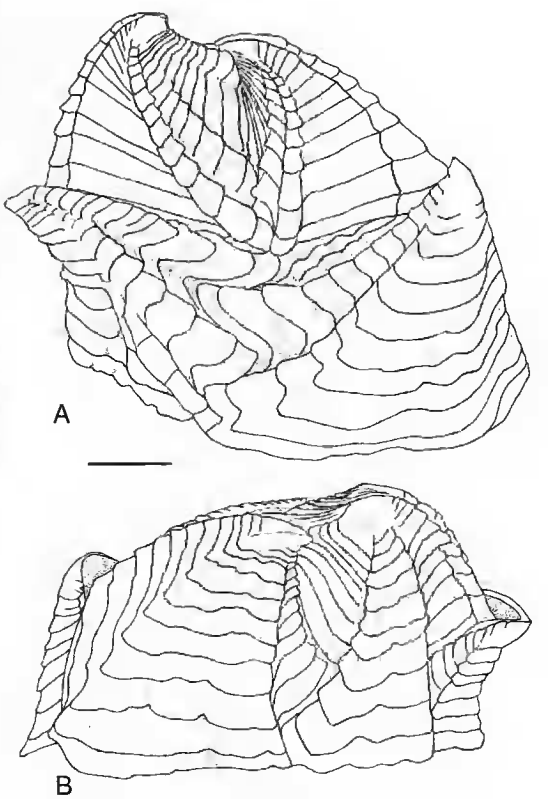

FIG. 10. — *Altiverruca gibbosa* (Hoek). **A**, top view; **B**, fixed-tergum and fixed-scutum view. Scale bar: 1 mm.

Genus *Metaverruca* Pilsbry, 1916

Metaverruca aequalis (Aurivillius, 1898)
(Figs 9, 11-12)

Verruca aequalis Aurivillius, 1898: 196. – Gruvel 1905, 176; 1920: 42, pl. 5, figs 28-29, pl. 6, figs 6-7. – Hoek 1907b: 9. – Belloc 1959: 4.

MATERIAL EXAMINED. — Stn 171, 1 specimen, rc: 0.5 cm, MNHN Ci 2589. — Stn 174, 1 specimen, rc: 0.4 cm, MNHN Ci 2591. — Stn 180, 4 specimens, rc: 0.5-0.6 cm, MNHN Ci 2598, MNRJ 8904. — Stn 196, 3 specimens, rc: 0.5-0.6 cm, MNHN Ci 2605, MNRJ 8905.

DESCRIPTION

Shell (Fig. 11A, B) white, nearly smooth, grooves only along the suture between rostrum and carina; growth lines widely spaced, projecting; basal margins thickened, inflected (Fig. 11C). Cuticle hairy, persistent on shell and opercular valves. Opercular valves parallel to base of wall.

Rostrum (Fig. 11A) larger than carina, with small radius-like projection toward fixed scutum; articulation with carina with large upper ridge and undulating downwards; shallow grooves beside ridge; apex projecting. Carina (Fig. 11A) with small radius-like projection toward fixed-tergum, one upper ridge undulating downwards at rostral suture, one groove under the ridge; apex reflexed. Fixed-tergum (Fig. 11A, B) smaller than fixed-rostrum, approximately one half its width, both sides with well developed alar-like projections; apex projecting backwards. Fixed-scutum (Fig. 11A, B) with wide alar-like projection directed toward rostrum, small radii-like projection to fixed-tergum; internally, with well developed myophore, directed downwards.

Tergum (Fig. 11A, D) quadrangular, with three

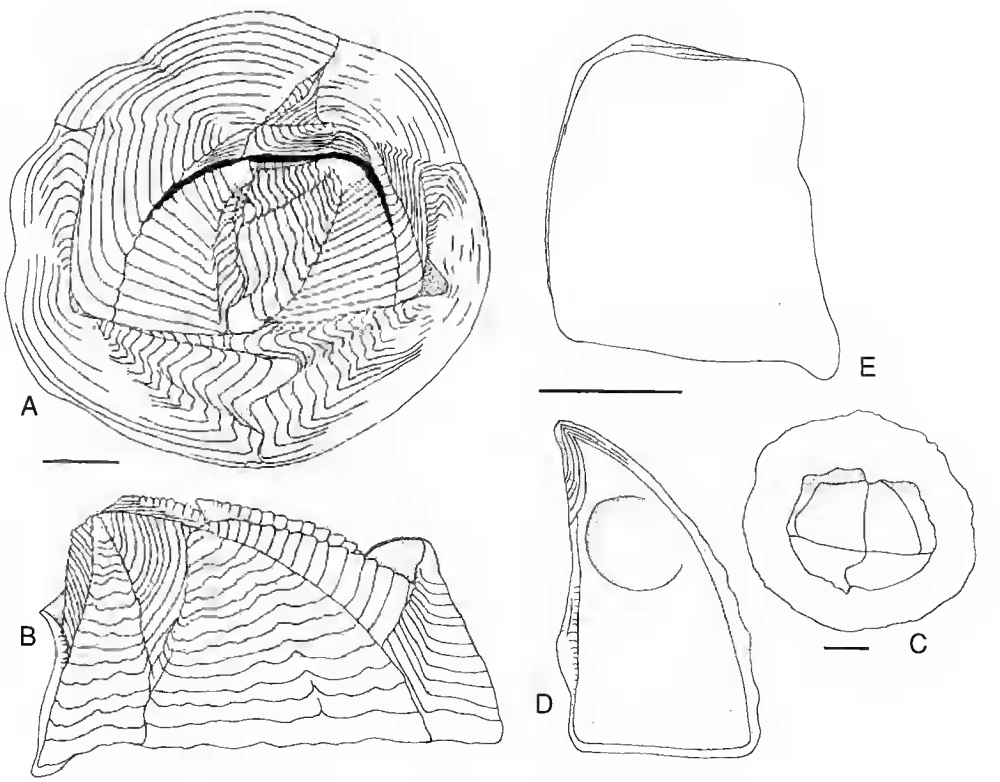

FIG. 11. — *Metaverruca aequalis* (Aurivillius). **A**, top view; **B**, fixed-tergum and fixed-scutum view; **C**, basal view; **D**, **E**, tergum and scutum, internal view. Scale bars: 2 mm.

articular ridges; axial ridge narrowest, well marked, intermediate and upper ridges broad. Internally, smooth; occludent margin slightly undulated. Scutum (Fig. 11A, E) smaller than tergum; with three articular ridges; axial ridge barely developed, near occludent margin, intermediate ridge twice width of upper ridge, latter poorly developed; rostral area smooth. Internally, with conspicuous rounded scar for adductor muscle, especially near articular margin, forming a vertical crest between them; occludent margin nearly straight, except for a protuberance at lower part.

Labrum (Fig. 12A) with series of small teeth (47). Palp (Fig. 12B) short, acuminate, with few simple setae on upper margin and distal region. Mandible (Fig. 12C) with three teeth, distance between first and second more than twice distance between the second and third one; lower angle denticulated. Maxilla I (Fig. 12D) with lower part projecting, shallow concavity apically; two large spines at upper angle, four small spines in concavity, seven to nine unpaired spines on lower portion. Maxilla II (Fig. 12E) rectangular, anterior margin with shallow concavity medially; covered by long simple setae.

Cirrus I (Fig. 12F) with subequal rami, covered with several long simple setae. Cirrus II (Fig. 12G) with anterior ramus two third length of posterior, articles more protuberant; both rami covered by numerous long, simple setae, anterior ramus also with finely bipectinate setae at distal article (Fig. 12H). Rami of cirrus III unequal, anterior shorter than posterior. Rami of cirri IV-VI equal in length. Intermediate articles of cirrus VI (Fig. 12I) with width three quarters of the length, two pairs of setae, longer setae finely pinnate, on anterior margin; one or two short, stout setae on posterior angle, multifid scales at distal margin. Caudal appendage (Fig. 12J) with six articles, one half length of coxopodite; long simple setae on distal margins of articles. Penis about same length as coxopodite, clothed with thin setulae. Number of articles of cirri I-III and caudal appendage is presented in table 5.

TABLE 5. — Number of articles of cirri I-III, and caudal appendage of *Metaverruca aequalis* (Aurivillius), stn 195. **I-III**, cirri I to III; **CA**, caudal appendage; **RC**, right cirri; **LC**, left cirri.

	I	II	III	CA
RC	10/9	8/10	14/16	6
LC	10/9	8/10	14/16	6

REMARKS

Metaverruca aequalis was described briefly by Aurivillius (1898), but was subsequently described in detail and figured by Gruvel (1920), based on the same material. The specimens examined herein agree with the description by Gruvel (1920). I can only add that the hairy cuticle is conspicuous in smaller specimens.

Gruvel (1920) did not dissect any specimen. Therefore, he did not describe the internal morphology of the shell, the opercular valves, and the appendages. The presence of a developed myophore on the fixed-scutum, the box-like shape of the wall with its inflected basal margins and the large opercular valves, indicate that the species is a *Metaverruca*.

Metaverruca aequalis is known only from the Azores, between depth of 1022 and 1385 m. All the samples studied are from the same area, but its depth distribution is increased to 3215 m (Fig. 9).

Metaverruca recta (Aurivillius, 1898)

Verruca recta Aurivillius, 1898: 195. – Gruvel 1905: 181; 1912a: 6; 1920: 46, pl. 2, fig. 18, pl. 3, figs 3-4. – Hoek 1907b: 9. – Southward & Southward 1958: 637, fig. 4. – Anderson 1980: 349, figs 1-4.

Verruca sculpta Aurivillius, 1898: 197. – Gruvel, 1905: 175; 1920: 41, pl. 5, figs 26-27. – Hoek 1907b: 9. – Nilsson-Cantell 1929: 461, fig. 1; 1938: 12. – Krüger 1940: 463. – Zevina 1969: 68. – Weisbord 1979: 97. – Foster 1981: 352. – Ren 1984: 166, fig. 1, pl. 1, figs 1-6; 1989: 420, fig. 10.

Verruca linearis Gruvel, 1900b: 243; 1902a: 107, pl. 5, figs 11-12; 1905: 182, fig. 201. – Hoek 1907b: 9.

Verruca capsula Hoek, 1907a: 130, pl. 12, figs 1-3, pl. 13, figs 1-4. – Stubbings 1936: 38. – Weisbord 1979: 98.

Verruca magna Gruvel, 1901: 261; 1902a: 109, pl. 5, figs 1-2; 1905: 184, figs 204-205. – Hoek 1907b: 9. – Gruvel 1920: 50. – Weisbord 1979: 98.

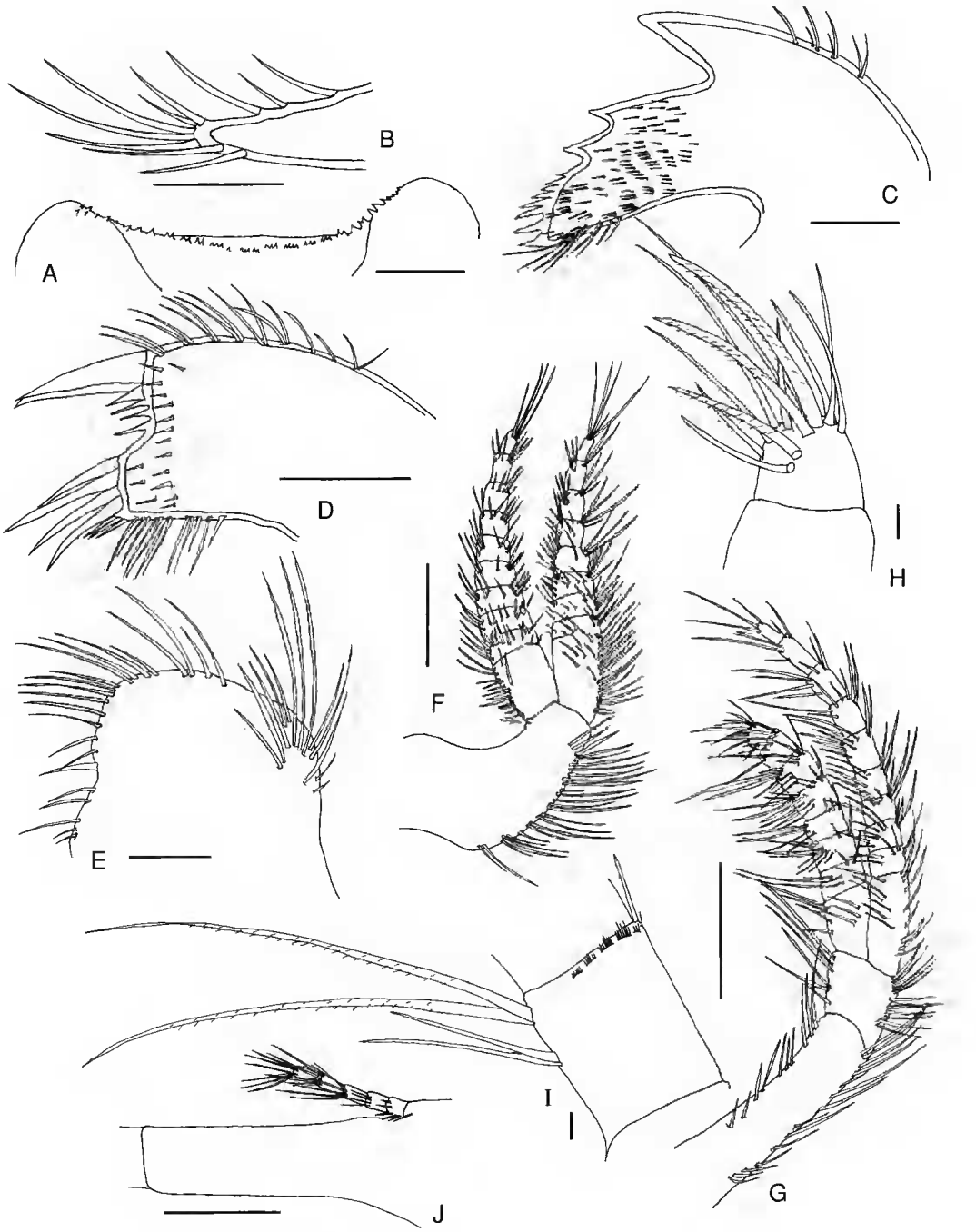

FIG. 12. — *Metaverruca aequalis* (Aurivillius). **A**, labrum; **B**, palp; **C**, mandible; **D**, maxillae I; **E**, maxillae II; **F**, cirrus I; **G**, cirrus II; **H**, distal article of anterior ramus of cirrus II; **I**, intermediate article of cirrus VI; **J**, caudal appendage. Scale bars: A-E, H, I, 0.1mm; F, G, J, 1 mm.

Verruca halotheca Pilsbry, 1907b: 188, pl. 4, figs 9-10; 1916: 46, pl. 8, figs 1-1a. – Kolosváry 1943: 73. – Zullo 1968: 219. – Gordon 1970: 118. – Buckeridge 1975: 129, figs 5. 4-6. – Foster 1978: 69, pl. 8F, fig. 42. – Weisbord 1979: 98.

Verruca coraliophila Pilsbry, 1916: 21, pl. 1, figs 1-5. – Zullo 1968: 219. – Bayer *et al.* 1970: A43. – Weisbord 1979: 96.

Verruca (*Metaverruca*) *sculpta* – Broch 1931: 41. – Buckeridge 1983: 59, fig. 45.

Verruca (*Metaverruca*) *cookei* – Rosell 1981: 299, pl. 11, figs r, s, u, v; 1991: 33 (not *Verruca cookei* Pilsbry, 1927).

Metaverruca recta – Buckeridge 1994: 116, fig. 13a-f. – Foster & Buckeridge 1995a: 182, fig. 15; 1995b: 368, fig. 9C-E.

MATERIAL EXAMINED. — Stn 4, 8 specimens and 10 empty shells, rc: 0.6-0.9 cm, MNHN Ci 2549. — Stn 16, 1 specimen, rc: 0.6 cm, MNHN Ci 2555. — Stn 62, 3 empty shells, rc: 0.6-0.7 cm, MNHN Ci 2560. — Stn 66, 1 empty shell, rc: 0.8 cm, MNHN Ci 2561. — Stn 135, 1 specimen, rc: 0.7 cm, MNHN Ci 2570. — Stn 139, 1 empty shell, rc: 0.7, MNHN Ci 2571. — Stn 148, 101 specimens and 12 empty shells, rc: 0.5-0.9 cm, MNHN Ci 2576, MNRJ 8906. — Stn 150, 2 specimens and 1 empty shell, rc: 0.6-0.6 cm, MNHN Ci 2578. — Stn 151, 27 specimens and 1 empty shell, rc: 0.5-0.9 cm, MNHN Ci 2580, MNRJ 8907. — Stn 159, 1 specimen, rc: 0.3 cm, MNHN Ci 2585. — Stn 161, 1 specimen, rc: 0.7 cm, MNHN Ci 2664. — Stn 168, 9 specimens and 4 empty shells, rc: 0.5-0.8 cm, MNHN Ci 2588. — Stn 180, 19 specimens and 5 empty shells, rc: 0.6-1.2 cm, MNHN Ci 2597, MNRJ 8908. — Stn 181, 4 specimens and 1 empty shell, rc: 0.6-0.7 cm, MNHN Ci 2600. — Stn 196, 10 specimens and 18 empty shells, rc: 0.6-1.0 cm, MNHN Ci 2604. — Stn 197, rc: 0.5-0.8 cm, MNHN Ci 2607. — Stn 199, 1 specimen, rc: 0.4 cm, MNHN Ci 2611. — Stn 218, 2 specimens and 1 empty shell, rc: 0.6-0.7 cm, MNHN Ci 2622. — Stn 231, 1 empty shell, rc: 0.7 cm, MNHN Ci 2626. — Stn 237, 1 specimen and 5 empty shells, rc: 0.6-0.7 cm, MNHN Ci 2629. — Stn 239, 10 specimens and 4 empty shells, rc: 0.6-0.9, MNHN Ci 2632. — Stn 240, 78 specimens and 10 empty shells, rc: 0.5-0.8 cm, MNHN Ci 2634, MNRJ 8909. — Stn 255, 2 specimens, rc: 0.9-1.1 cm, MNHN Ci 2650.

REMARKS

Metaverruca recta is the most common deep-sea verrucid found in the Azores region. It was collected from over several distinct substrates, such as pumice stones, shells, corals, and urchin spines. It has a world-wide distribution, and was recorded many times from the Northeastern Atlantic, including the Azores from 240 to 2100 m (Aurivillius 1898; Gruvel 1912a, 1920; Southward & Southward 1958; Foster & Buckeridge 1995a; Young in press).

The specimens studied do not present significant differences from those observed by other authors. The white shell is totally smooth, and has a straight hinge between the opercular valves and the rostrum and carina, characters which are diagnostic for this species.

Metaverruca trisulcata (Gruvel, 1900b) (Figs 9, 13-14)

Verruca trisulcata Gruvel, 1900b: 243; 1902a: 96, pl. 5, figs 9-10; 1905: 184, fig. 203; 1912b: 348; 1920: 49. – Hoek 1907b: 9.

Verruca striata Gruvel, 1900b: 244; 1902a: 98, pl. 5, figs 5-6, textfig. 17-18; 1905: 183, fig. 186, 202. – Hoek 1907b: 9. – Stubbings 1967: 251.

not *Metaverruca trisulcata* – Foster & Buckeridge 1995a: 177, figs 10-12; 1995b: 363, fig. 9a-b.

MATERIAL EXAMINED. — Stn 197, 2 specimens, rc: 0.5 cm, MNHN Ci 2608, MNRJ 8910. — Stn 240, 1 specimen, rc: 0.4 cm, MNHN Ci 2635.

DESCRIPTION

Shell (Fig. 13A, B) white, cuticle not persistent, ornamented with several strong longitudinal ridges and spaced growth lines, ridges on opercular plates and at suture of rostrum and carina conspicuous. Opercular plates parallel to basis. Basal margin of wall not inflected.

Fixed-tergum (Fig. 13A, B) smaller than fixed-scutum, apex thickened, recurved outward; with two developed alate projections and triangular central area, with four to five longitudinal ridges.

Fixed-scutum (Fig. 13A, B) having central triangular area with four to five strong longitudinal ridges, well developed alate projection at rostral suture area, radius-like projection at fixed-tergum side; apex thickened, recurved outward. Internally, with well developed myophore.

Carina (Fig. 13A) same size as rostrum, with about ten strong longitudinal ridges and well

developed ridge area at suture with rostrum, with four interlocking teeth, the largest being usually the second; smooth suture with fixed-tergum. Rostrum (Fig. 13A) with many strong longitudinal ridges, well developed ridged area at suture with carina, with four interlocking teeth, the first one being the largest, smooth suture with fixed-scutum.

Tergum (Fig. 13A, C) larger than scutum, nearly quadrangular, with three articular ridges; axial ridge highest and as wide as second, distance between ridges equal, groove between first and second ridges greater than between second and third ones; no ridges at carinal area. Internally, surface flat and smooth; scutal margin slightly concave, with median tooth.

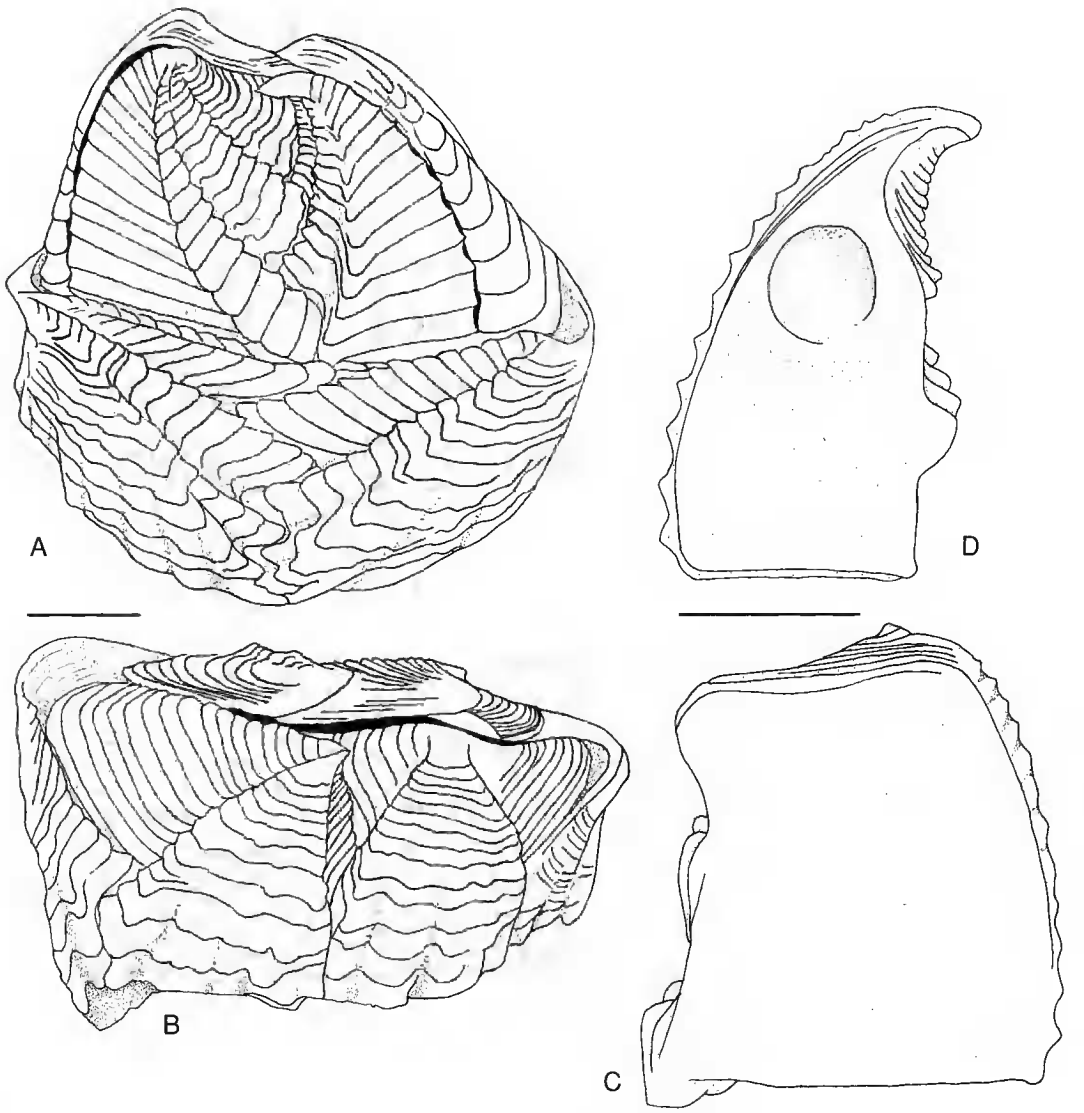

FIG. 13. — *Metaverruca trisulcata* (Gruvel). **A**, top view; **B**, fixed-tergum and fixed-scutum view; **C**, **D**, tergum and scutum, internal view. Scale bars: 1 mm.

Scutum (Fig. 13A, D) with three articular ridges, third ridge thin, sloping continuously to rostral area, no ridges at rostral area; apex pointed, directed toward tergum. Internally, tergal margin nearly straight, with tooth at lower third; surface with conspicuous upper depression, including adductor muscle pit.

Labrum (Fig. 14A) with series of irregular teeth. Palp (Fig. 14a) short, acuminated, with few simple setae on upper margin and distal region. Mandible (Fig. 14B) with three teeth, distance between first and second teeth twice distance between the second and third ones; lower angle denticulated. Maxilla I (Fig. 14C) with lower part projected; two large spines and five small spines on upper edge of cutting edge and thirteen moderate to small unpaired spines on lower part. Second maxilla not observed.

Cirrus I (Fig. 14D) with subequal rami, anterior slightly longer than posterior one; both with protuberant articles covered by long, simple setae. Cirrus II (Fig. 14E) with anterior ramus about two third length of posterior, with articles more protuberant; both rami covered by long, simple setae. Cirri III with unequal rami, anterior shorter than posterior; cirri with rami of IV-VI equal length. Intermediate articles of cirrus VI with width about two third length, three pairs of long setae on anterior margin, two setae on posterior angle. Caudal appendage (Fig. 14F) multiarticulated, seven articles, one half length of coxopodite; long simple setae on distal margins of articles. Number of articles of cirri I-VI and caudal appendage is presented in table 6. The specimens dissected had approximately fifty eggs each (from station 197).

TABLE 6. — Number of articles of cirri I-VI, and caudal appendage of *Metaverruca trisulcata* (Gruvel), stn 197. **I-VI**, cirri I to VI; **CA**, caudal appendage; **RC**, right cirri; **LC**, left cirri.

	I	II	III	IV	V	VI	CA
RC	11/15	8/12	16/19	21/23	23/25	25/26	7
LC	15/12	8/12	16/19	12+/23	24/24	24/26	7

REMARKS

M. trisulcata was described by Gruvel (1900b, 1902a, 1920) from the Azores, and it was later recorded from the coast of Morocco (Gruvel 1912b). Foster & Buckeridge (1995a, b) recorded it from off the Straits of Gibraltar and La Réunion (Indian Ocean). These authors considered *Verruca imbricata* Gruvel, 1900b, *V. striata* Gruvel, 1900b and *V. radiata* Gruvel, 1901 as synonyms of *M. trisulcata*. Herein I only consider *V. striata* synonymous of *V. trisulcata*, included in the *Metaverruca*. *Verruca imbricata* and *V. radiata* are considered valid and included in *Newmaniverruca* n.g.

The specimens examined are in accordance with the detailed description of the external characters presented by Gruvel (1902a), except the width of the second and third ridges of the tergum are equal, instead of the second being wider. The ornamentation of the rostrum and carina, the ridges of tergum and scutum, and the apex of scutum, serve as a diagnostic of this species.

Gruvel (1900b, 1902a) did not describe the appendages of *V. trisulcata*, which are described herein, but he described the appendages of *V. striata* (Gruvel, 1902c), which is here considered synonymous. The description of the appendages of *V. striata* concord with those I observed, except that of the caudal appendage. Gruvel (1902c) observed nine articles that were longer than coxopodite of cirrus VI, instead of seven articles that are one half the length of the coxopodite. *Verruca striata* also differs from *V. trisulcata*: scutum with apex not curved, with three articular ridges similar in width, and the apices of the carina and rostrum not projecting. Notwithstanding these differences, I agree with Foster & Buckeridge (1995a, b) and consider this species synonymous with *V. trisulcata*.

On the other hand, I do not consider *V. imbricata* and *V. radiata* as synonyms of *M. trisulcata*, due to several differences in the number and form of the ridges of the scutum and tergum, and on the number and development of the radial ridges of the shell. Foster & Buckeridge (1995a, b) stated that the number of ridges between the tergum and the scutum increased with growth, from one to four in specimens of about 6 mm in rostrocarinal length. The three specimens I studied had a length between 0.44 and 0.52 mm and all had a constant number of ridges, as in Gruvel's type. In the specimens from

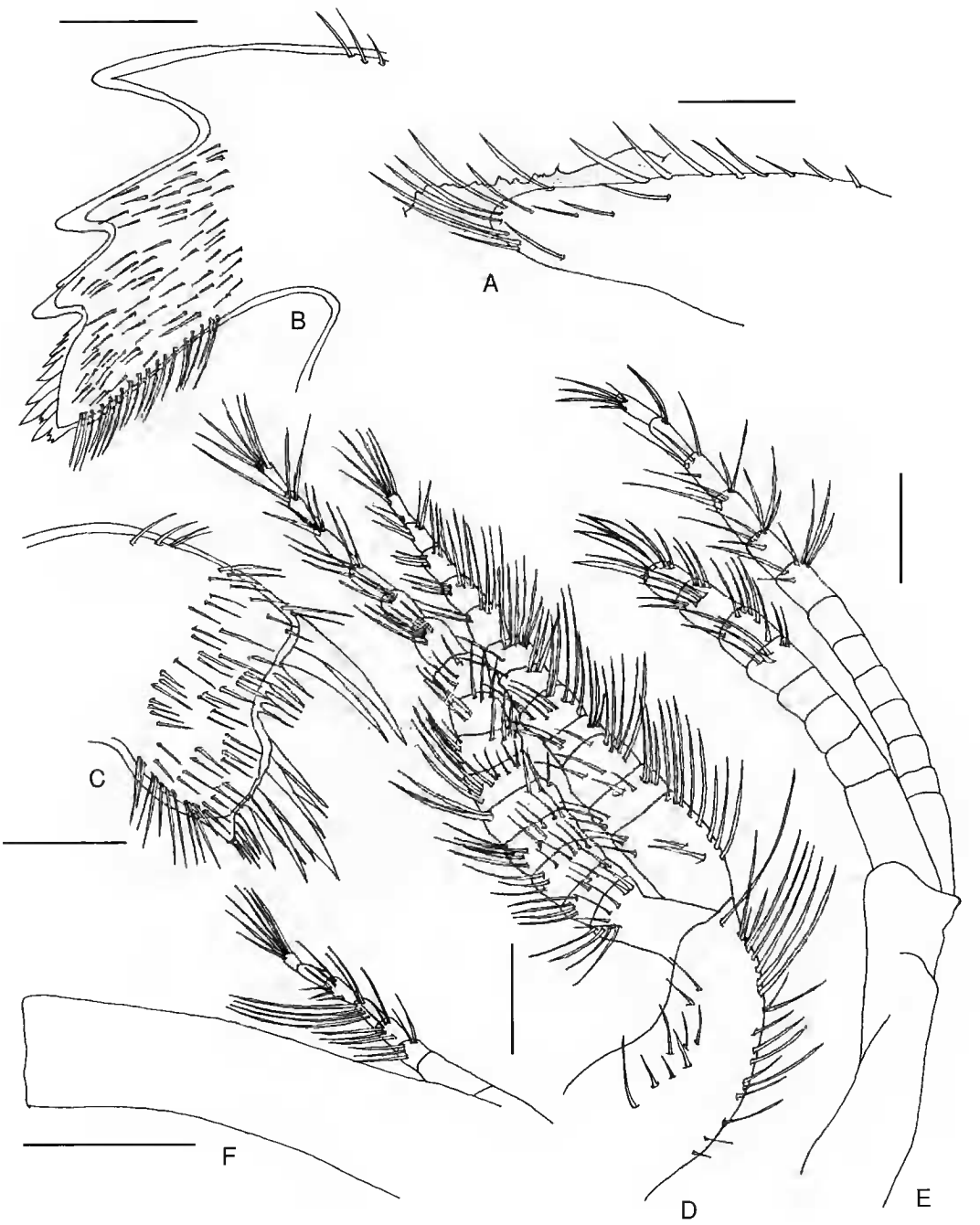

FIG. 14. — *Metaverruca trisulcata* (Gruvel). **A**, detail of labrum and palp; **B**, mandible; **C**, maxilla I; **D**, cirrus I; **E**, cirrus II, only setae of distal articles shown; **F**, caudal appendage. Scale bars: A-C, F, 0.1 mm; D, E, 0.3 mm.

La Réunion (Foster & Buckeridge 1995b), besides the variable number of ridges, the specimens exhibit a plasticity in the form of the shell from *low splayed to quite upstanding*. Cirri I and II have the anterior ramus one half the length of the posterior one and the caudal appendage with *0.66* or *0.5* (sic) the length of cirrus VI. For the specimens from the Straits of Gibraltar, Foster & Buckeridge (1995a) repeated the same description as that for the La Réunion samples, only adding new figures. Therefore, the differences observed in the shell and appendages of both samples appears to be yet another species, or possibly more than one species due to the high variability described.

The distribution of *M. trisulcata* is restricted to the Azores region and off Morocco (Fig. 9).

Genus *Costatoverruca* n.g.[1]

Costatoverruca cornuta (Aurivillius, 1898)

Verruca cornuta Aurivillius, 1898: 197. – Gruvel 1905: 174; 1912a: 5; 1920: 39, pl. 2, figs 12-13, pl. 3, figs 9-10. – Hoek 1907b: 9. – Belloc 1959: 4.

MATERIAL EXAMINED. — Stn 62, 1 specimen, rc: 0.5 cm, MNHN Ci 2662. — Stn 148, 13 specimens and 1 empty shell, rc: 0.4-0.7 cm, MNHN Ci 2577, MNRJ 8911. — Stn 150, 2 specimens, rc: 0.4 cm, MNHN Ci 2579. — Stn 151, 3 specimens, tl: 0.4-0.5 cm, MNHN Ci 2670. — Stn 157, 5 specimens, rc: 0.5, MNHN Ci 2582. — Stn 159, 1 specimen, rc: 0.4 cm, MNHN Ci 2586. — Stn 161, 25 specimens, rc: 0.2-0.4 cm, MNHN Ci 2587, MNRJ 8912. — Stn 181, 8 specimens, rc: 0.3-0.6 cm, MNHN Ci 2601. — Stn 199, 6 specimens, rc: 0.5 cm, MNHN Ci 2612, MNRJ 8913. — Stn 237, 2 specimens, rc: 0.4 cm, MNHN Ci 2630. — Stn 239, 646-628 m, 1 specimen, rc: 0.4 cm, MNHN Ci 2633.

REMARKS

The external shell characters *C. cornuta* were described by Aurivillius (1898), and later in greater detail by Gruvel (1920), both of which are based on samples from the Azores. Young (in press) redescribes this species, including a description of the appendages, based on new samples from the Azores.

All of the specimens studied were collected in the Azores and at a depth previously recorded, 450 to 1229 m.

Genus *Verruca* Schumacher, 1817

Verruca stroemia (Müller, 1776) (Figs 15-17)

Lepas strömia Müller, 1776: 251.

Verruca strömia – Darwin 1854: 518, pl. 21, fig. 1a-f. – Pilsbry 1916: 24.

Verruca stroemia – Nilsson-Cantell 1978: 48, figs 23-24.

MATERIAL EXAMINED. — Stn 14, 2 specimens on *Dendrophyllia cornigera*, MNHN Ci 2554. — Stn 259, 720 specimens, MNHN Ci 2653, MNRJ 8914.

DESCRIPTION

Shell (Fig. 15A) white or translucent, flattened, usually with rostrum prominent, cuticle not persistent, ornamented with several longitudinal ridges, sometimes nodose, and irregular growth lines; ridges at suture between rostrum and carina and between rostrum and fixed-scutum conspicuous and projecting. Opercular plates (Fig. 15A) parallel with basis, reduced in size, less than one half rostrocarinal diameter. Surface of opercular plates and shell permeated by several rows of tubes in small specimens, tubes parallel to growth lines sealed in larger ones. Basal margin of wall not inflected.

Fixed-tergum (Fig. 15A) same size as fixed-scutum, marginal apex thickened, recurved outward; alate projections to carina, nearly straight sutures to fixed-scutum.

Fixed-scutum (Fig. 15A) nearly quadrangular, upper surface turned toward rostral margin of free scutum; suture with fixed-tergum simple and nearly straight; rostrum having conspicuous ridges; apex marginal, not recurved. Internally, with well developed myophore parallel to basis.

Carina (Fig. 15A) smaller than rostrum, surface with longitudinal ridges knobbed; well developed

1. See the part of the revision of Verrucidae for generic diagnosis.

ridge area at suture with rostrum, forming deep grooves between ridges, with five interlocking teeth, ridges decreasing slightly in size from apex to basis; with radius-like projection to fixed-tergum.

Rostrum (Fig. 15A) with well developed ridged area at suture with carina, forming deep grooves between ridges, with four to five interlocking teeth, ridges decreasing in size from apex to basis; suture with fixed-scutum also with conspicuous ridges.

Opercular plates with conspicuous and projecting growth lines. Tergum (Fig. 15A, B) larger than scutum, nearly quadrangular, with three articular ridges; axial ridge high, conspicuous at both sides, about same width as second; ridges absent at carinal area. Internally, surface flat, with some visible sealed tubes, scutal margin with deep medial notch, forming articular ridge at upper margin.

Scutum (Fig. 15A, C) with three low articular ridges, axial ridge low and thin, sloping continuously to rostral area; first ridge wider than second; rostral area, slightly medially depressed, ridges absent; width of plate about one third its height. Internally, surface with some sealed tubes and conspicuous upper depression, which includes the adductor muscle pit, tergal margin sinuous.

Labrum with row of simple, sharp teeth. Palp (Fig. 16A) acuminate, simple setae at upper margin. Mandible (Fig. 16B) with three teeth, second and third with subsidiary cusps, denticles on lower angle. Maxilla I (Fig. 16C) with lower anterior border projecting anteriorly; upper border with two large spines, followed by nineteen to twenty moderate and small spines at lower border. Maxilla II (Fig. 16D) bilobed, numerous simple setae along its margins.

Cirrus I (Fig. 16E) with unequal rami, anterior ramus two third length of posterior, both rami with protuberant articles covered by numerous simple setae. Cirrus II (Fig. 16F) with unequal rami, anterior ramus about one quarter length of posterior, both rami covered by numerous simple setae; distal articles of anterior ramus with bipectinate setae. Cirrus III (Fig. 16G) with unequal rami; anterior ramus about one third length of posterior; both rami covered by numerous simple setae, distal articles of anterior ramus with bipectinate setae. Cirri IV to VI with equal rami; intermediate articles (Fig. 16H) with four pairs of setae on anterior margin, one or two setae on posterior angle; width about one half length. Caudal appendage (Fig. 16I) multiarticulated, sixteen articles, three times length of coxopodite of cirrus VI; articles covered by numerous simple setae at distal margins; basal articles with multifid scales. Number of articles cirri I-VI and caudal appendage is presented in table 7.

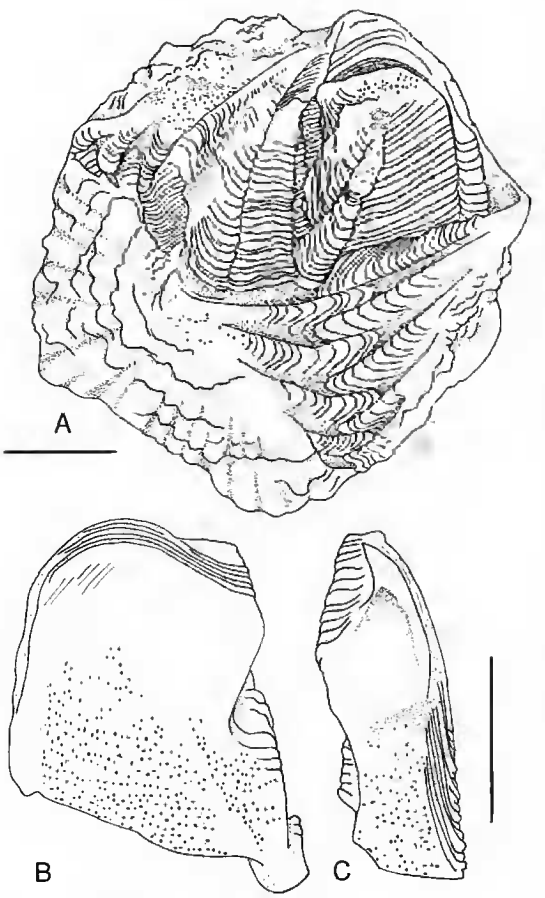

FIG. 15. — *Verruca stroemia* (Müller). **A**, top view; **B**, **C**, tergum and scutum, internal view. Scale bars: 1 mm.

REMARKS

Verruca stroemia is a common temperate and polar species from the Northeastern Atlantic,

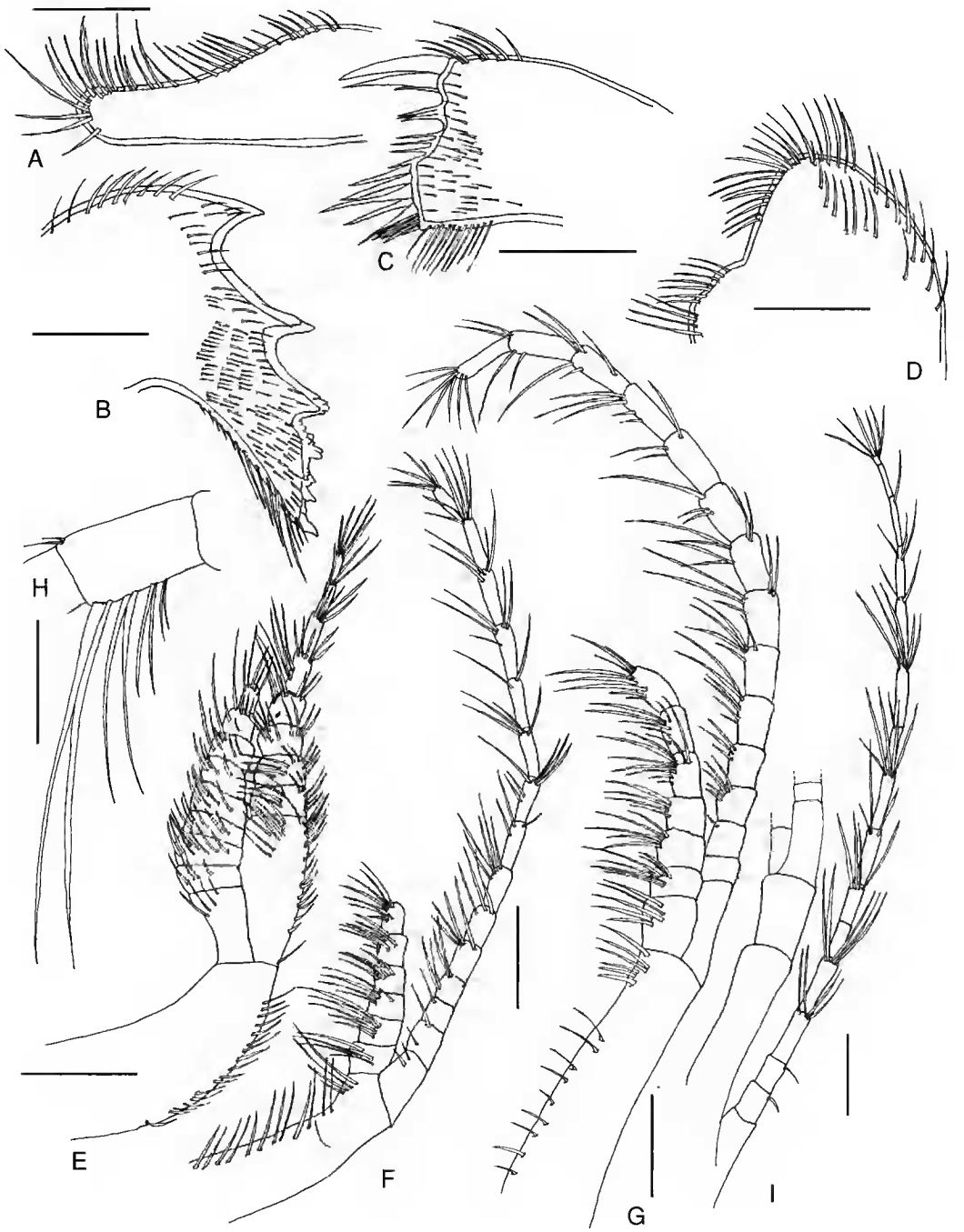

FIG. 16. — *Verruca stroemia* (Müller). **A**, palp; **B**, mandible; **C**, maxilla I; **D**, maxilla II; **E**, cirrus I; **F**, cirrus II; **G**, cirrus III; **H**, intermediate article of cirrus VI; **I**, caudal appendage. Scale bars: A-D, H, 0.1 mm; E-G, I, 0.2 mm.

TABLE 7. — Number of articles of cirri I-VI, and caudal appendage of *Verruca stroemia* (Müller), stn 14. **I-VI**, cirri I to VI; **CA**, caudal appendage; **RC**, right cirri; **LC**, left cirri.

	I	II	III	IV	V	VI	CA
RC	9/9	6/15	7/15	17/21	21/22	23/25	16
LC	9/8	6/16	8/18	18/19	21/22	24/26	16

where it occurs from the intertidal zone to 548 m, with doubtful records from 960-998 and 2600 m. The latter record was from the Azores region, which is the most southern record for this species (Gruvel 1902a, 1920).

In several samplings by the *Meteor* (Young in press) and the *Jean Charcot* expeditions in the Azores, not a single specimen of *V. stroemia* has been collected. However, *V. spengleri*, a species similar to *V. stroemia*, is common in this region, but it does not occur at the depths cited by Gruvel. It appears that the Gruvel (1902a, 1920) records represent other verrucids species.

The specimens of *V. stroemia* studied herein were collected off Portugal, which is accepted here as the southern limit of its distribution.

Verruca stroemia has been recorded from the Spitsbergen, Greenland, Iceland, the Faeroe Islands, Great Britain, and the Norwegian to Portugal coasts (Nilsson-Cantell 1978), with scattered records along the European coast of the Mediterranean Sea, from France to the Adriatic Sea (Fischer 1871; Kolosváry 1947, 1951; Relini 1969). There is also one doubtful record from the Red Sea (Darwin 1854; Fig. 17). Due to the superficial similarity between *V. stroemia* and *V. spengleri* all records from the Mediterranean need to be reviewed (see remarks under *V. spengleri*).

Verruca spengleri Darwin, 1854
(Figs 17-19)

Verruca spengleri Darwin, 1854: 521, pl. 21, fig. 2. – Weltner 1897: 274. – Hoek 1883: 133. – Gruvel 1905: 182, fig. 200; 1920: 48. – Hoek 1907b: 9. – Pilsbry 1916: 40. – Baker 1967: 47. – Buckeridge 1994: 90.

Verruca stroemia – Ruggieri 1953: 46 (not *V. stroemia* Müller).

? *Verruca spengleri* – Tarasov & Zevina 1957: 151, figs 49-50. – Zevina 1963: 73. – Ruggieri 1977: 71k, figs 3-5.

MATERIAL EXAMINED. — Stn L8, 1 specimen, MNHN Ci 2541. — Stn P3, 42 specimens, MNHN Ci 2507. — Stn P4, 46 specimens, MNHN Ci 2509. — Stn P6, 218 specimens, MNHN Ci 2511. — Stn P7, more than 100 specimens, MNHN Ci 2513, MNRJ 8915. — Stn P8, more than 100 specimens, MNHN Ci 2516, MNRJ 8916. — Stn P9, 30 specimens, MNHN Ci 2518. — Stn P12, 86 specimens, MNHN Ci 2521. — Stn P13, 1 specimen, MNHN Ci 2522. — Stn P17, 4 specimens, MNHN Ci 2658. — Stn P19, 110 specimens, MNHN Ci 2525. — Stn P23, 68 specimens, MNHN Ci 2526. — Stn P24, 98 specimens, MNHN Ci 2527. — Stn P27, 280 specimens, MNHN Ci 2528, MNRJ 8917. — Stn P29, 298 specimens, MNHN Ci 2529, MNRJ 8918. — Stn P30, 1 specimen, MNHN Ci 2660. — Stn P33, 86 specimens, MNHN Ci 2532. — Stn 1, 52 specimens, MNHN Ci 2547. — Stn 61, 69 specimens, MNHN Ci 2558. — Stn 142, 22 specimens, MNHN Ci 2572. — Stn 143, 1 specimen, MNHN Ci 2573. — Stn 216, 62 specimens, MNHN Ci 2619. — Stn 224, 16 specimens, MNHN Ci 2623.

DESCRIPTION

Shell (Fig. 17A) white or translucent; cuticle not persistent; flattened; usually with rostrum more prominent, ornamented only with irregular growth lines; ridges at suture between rostrum and carina conspicuous and projecting. Opercular plates (Fig. 17B) parallel to basis, reduced in size, less than one half rostrocarinal diameter. Surface of opercular plates (Fig. 17A-D) and shell permeated by several persistent rows of tubes, parallel ro growth lines. Basal margin of wall not inflected.

Fixed-tergum (Fig. 17A) smaller than fixed-scutum, marginal apex thickened, recurved outward; alate projections absent, sutures essentially straight or with small ridge at carinal suture.

Fixed-scutum (Fig. 17A) nearly quadrangular, upper surface turned toward rostral margin of scutum; suture areas simple and nearly straight, small to large ridge at suture of rostrum; apex marginal, not recurved outward. Internally, with well developed myophore parallel to the basis.

Carina (Fig. 17A) smaller than rostrum, well developed ridge area at suture with rostrum

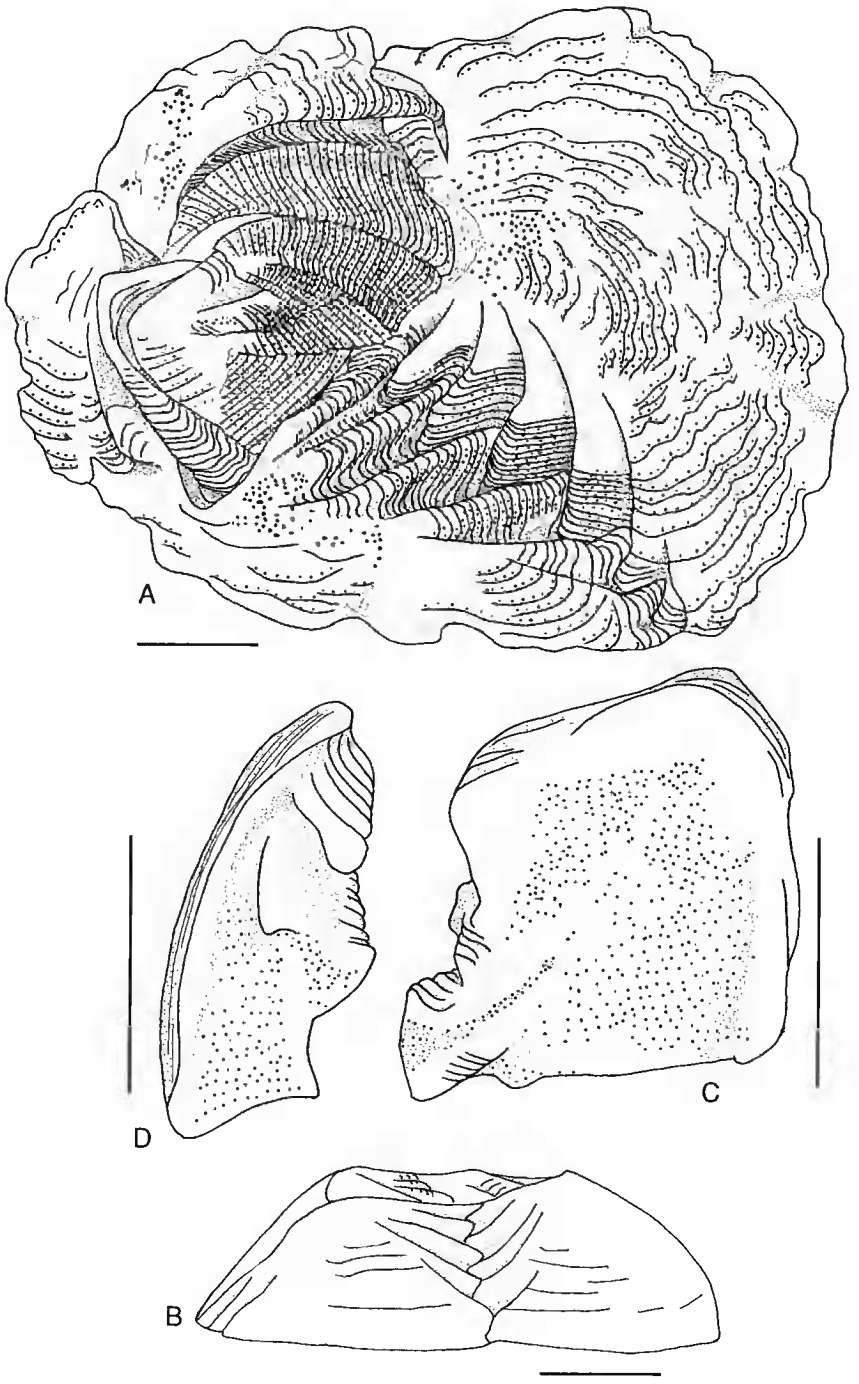

FIG. 17. — *Verruca spengleri* Darwin. **A**, top view; **B**, carino-rostral view; **C**, **D**, tergum and scutum, internal view. Scale bars: 1 mm.

FIG. 18. — *Verruca spengleri* Darwin. **A**, labrum and palp; **B**, mandible; **C**, maxilla I; **D**, maxilla II; **E**, cirrus I; **F**, cirrus II; **G**, distal article of anterior ramus of cirrus II; **H**, cirrus III; **I**, intermediate article of cirrus VI; **J**, caudal appendage and penis; **K**, basal articles of caudal appendage. Scale bars A-D, G, I, K, 0.1 mm; E, F, H, J, 1.0 mm.

forming deep grooves between ridges, five ro seven interlocking teeth, ridges decreasing slightly in size from apex ro basis; suture with fixed-tergum wirh low ridges.

Rostrum (Fig. 17A) with well developed ridged area at suture with carina, forming deep grooves between ridges, four to six interlocking teeth, ridges decreasing slightly in size from apex to basis; suture with fixed-scutum nearly smooth or depressed for fixed-scutum tooth.

Opercular plates with growth lines conspicuous, but not projecting. Tergum (Fig. 17C) larger than scutum, nearly quadrangular, three articular ridges; axial tidge elevated, conspicuous at both sides, as wide as second, distance between ridges equal, groove between first and second larger than that between second and third; without ridges at carinal area. Inrernally, surface flat, some sealed tubes visible; scutal margin sinuous.

Scutum (Fig. 17D) with three low articular ridges, axial ridge low, thin, sloping continuously ro rostral area; first and second ridges equal in width or latter wider, no ridges at rostral area; greater width of plate about one half scutum height. Internally, surface with some sealed tubes visible, adductor ridge conspicuous; tergal margin sinuous.

Labrum (Fig. 18A) with tow of twenty-four simple, sharp teeth. Palp (Fig. 18A) acuminate, simple setae at upper margin. Mandible (Fig. 18B) with three teeth, second and third usually with subsidiary cusps at upper margin, low denricles on lowet angle. Maxilla I (Fig. 18C) with lower anterior border projecting anteriorly; upper border with two or three large spines, followed by fifteen to twenty-four intermediate to small spines at lower border. Maxilla II (Fig. 18D) bilobed, with numerous simple setae along its margins.

Cirrus I (Fig. 18E) with unequal rami, anterior ramus one half length of posterior, anrerior ramus with proruberant articles, covered by numerous simple setae, posterior ramus with slightly protuberant articles.

Cirrus II (Fig. 18F) with unequal rami, anterior ramus about one third length of posterior, both rami covered by numerous simple setae, distal articles of anterior ramus with bipecrinate serae (Fig. 18G).

Cirrus III (Fig. 18H) with unequal rami, anterior ramus about one half length of posterior, borh rami covered by numerous simple setae, distal articles of anterior ramus with bipectinate setae.

Cirri IV to VI with equal rami; intermediate articles (Fig. 18I) with four pairs of setae on anterior margin, one or two setae on posterior angle, small spinules on distal margin, length about one half width. Caudal appendage (Fig. 18J) multiarticulated, with fourteen articles, two and one half times length of coxopodite of cirrus VI; articles covered by numerous simple setae at distal margins; basal articles (Fig. 18K) with spinules and multifid scales.

Number of articles of cirri I-VI and caudal appendage is presented in table 8.

TABLE 8. — Number of articles of cirri I-VI, and caudal appendage of *Verruca spengleri* Darwin, stn P6. **I-VI**, cirri I to VI; **CA**, caudal appendage; **RC**, right cirri; **LC**, left cirri; **+**, broken ramus.

	I	II	III	IV	V	VI	CA
RC	8/11	6/13	7/15	17/18	16+/21+	23+/22+	+
LC	8/11	6/14	8/15	18/18	20/21	23/22	14

REMARKS

Darwin (1854) described and figured specimens of *V. spengleri*, bur he only illustrated the internal view of the scutum. This species is similar to *V. stroemia*, but the well developed adductor tidge of the movable scutum in *V. spengleri* readily separates these species. Otherwise, both species can be distinguished by *V. spengleri* having a relatively narrower scutum, the first and second ridges being of equal width, the shell being permeated by tubes, and lacking longitudinal ridges.

Verruca spengleri was first described from Madeira Island (Darwin, 1854) and later, from the Azores (Gruvel 1920; Baker 1967) and Black Sea (Tarasov & Zevina 1957). Darwin (1854) noted that "from geographical considerations" *V. spengleri* probably was rhe species found in the Mediterranean. Ruggieti (1977) cited this species in Southern Italy, and also noted that probably all of the citations of *Verruca* from the Mediterranean Sea were actually *V. spengleri*. Ruggieri (1977) did not describe his specimens, bur his

figures 3 and 4 show the scutum with a developed adductor ridge, a thin first external ridge, and a width/height ratio of one half, which agrees with the description of *V. spengleri*.

Tarasov & Zevina (1957) cited *V. spengleri* as common in the Black Sea, between 20 and 50 m. The specimens described are similar to those I observed, but the scutum is relatively larger and the axial ridge is placed in the middle of the basal margin (Tarasov & Zevina 1957, fig. 49). In addition, the caudal appendage has only nine articles. Therefore, I consider the identification of the Black Sea specimens of *V. spengleri* as dubious, and in need of further confirmation. Due to the large differences between the specimens from the Azores-Madeira Archipelagos and the Black Sea, I suspect that the Mediterranean specimens may well be an undescribed species.

Verruca spengleri is common in the Madeira and Azores Archipelagos, from between the intertidal zone and 103 m. Gruvel (1920) also recorded it from 130 to 440 m (Fig. 19).

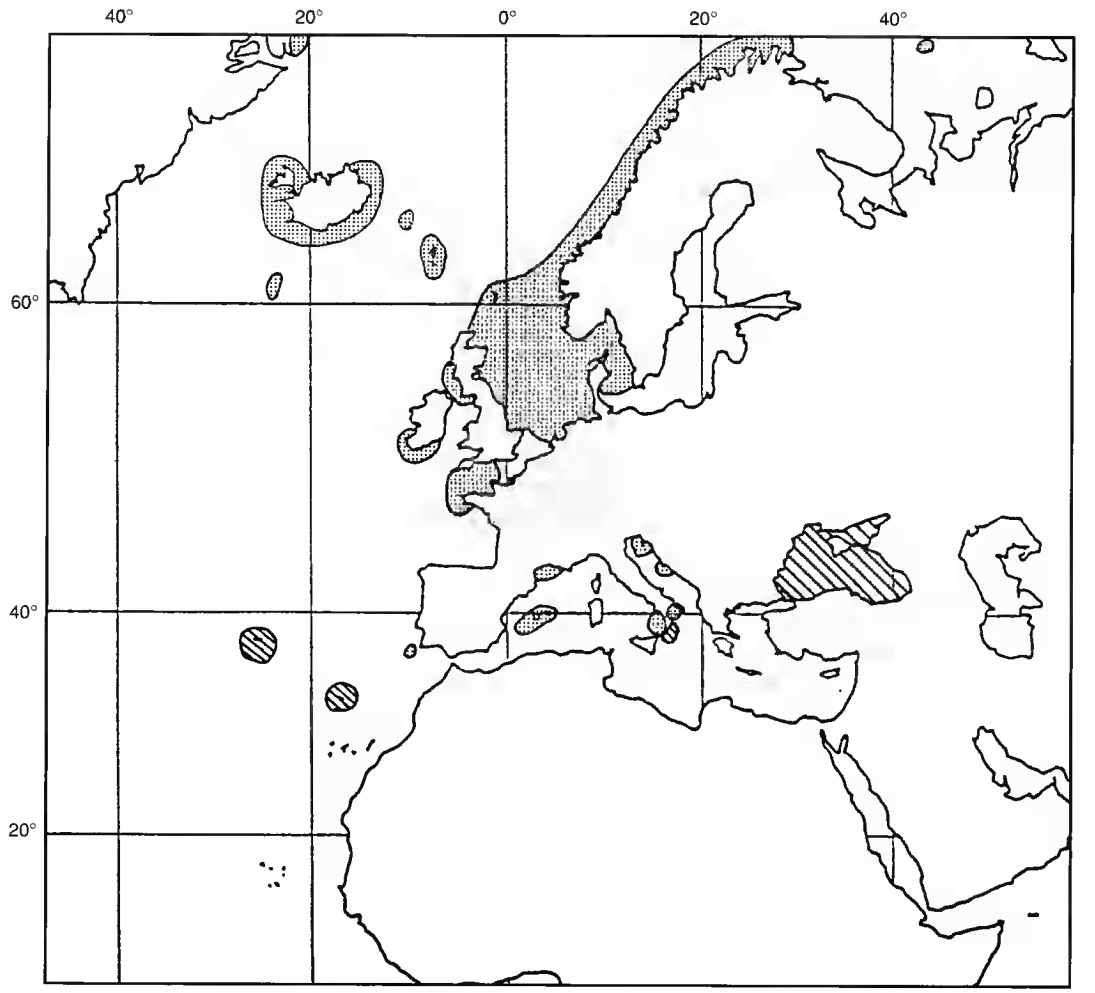

Fig. 19. — Geographic distribution of *Verruca stroemia* (Müller) (dotted) and *Verruca spengleri* Darwin (hatched).

Suborder BALANOMORPHA Pilsbry, 1916
Family CHTHAMALIDAE Darwin, 1854
Genus *Chthamalus* Ranzani, 1817

Chthamalus stellatus (Poli, 1791)

Lepas stellatus Poli, 1791: 29, pl. 5, figs 18-20.

Chthamalus stellatus – Darwin 1854: 45, pl. 18, figs 1a, c, e-f, h (part). – Southward 1976: 1009, text-figs 1-2, 6, pl. 1, figs c-d, f-g, pl. 2, figs a-b, d (synonymy).

Chthamalus stellatus stellatus – Pilsbry 1916: 302, pl. 71, figs 1-4a. – Nilsson-Cantell 1921: 281.

MATERIAL EXAMINED. — Stn L5, 96 specimens, MNHN Ci 2537, MNRJ 8919. — Stn L11, 3 specimens, MNHN Ci 2657.

DIAGNOSIS AND DESCRIPTION. — See Southward 1976: 1009.

REMARKS

The present specimens conform to the description of the shell and appendages formulated by Southward (1976). *Chthamalus stellatus* is widely distributed from the northern Scottish coast and English Channel, to the Mediterranean Sea, to the tropical coast of West Africa, Mauritania and with some doubtful records south of the Cameroons (Stubbings 1967; Southward 1976). It was also recorded from Madeira, Cape Verde and Azores Islands (Darwin 1854; Stubbings 1964; Baker 1967). It is abundant between the Low Water Mark and the splash zone on all rocky shores of the São Jorge Island (Baker 1967). The *Jean Charcot* Expedition collected this species at Santa Maria and Faial Island; thus it has a wide distribution within the Azores Archipelago.

Family BATHYLASMATIDAE Newman *et* Ross, 1971
Genus *Bathylasma* Newman *et* Ross, 1971

Bathylasma hirsutum (Hoek, 1883)

Balanus hirsutus Hoek, 1883: 158, pl. 13, figs 8-15.

Bathylasma hirsutum – Newman & Ross 1971: 149, textfig. 73, pl. 23-24 (synonymy).

MATERIAL EXAMINED. — Stn 6, eroded shell fragments, MNHN Ci 2551. — Stn 46, 9 pieces of eroded and disarticulated plates of the shell, MNHN Ci 2556. — Stn 180, 1 scutum, MNHN Ci 2667. — Stn 240, 1 eroded carina, MNHN Ci 2668. — Stn 255, 13 specimens fragmented, rc: 1.4-2.4 cm, MNHN Ci 2651, MNRJ 8920. — Stn 260, 3 specimens, rc: 1.5-2.8 cm, MNHN Ci 2655.

REMARKS

Bathylasma hirsutum appears to be one of the most common Northern Hemisphere deep-sea balanomorph barnacles. It has been recorded several times in the Northeast Atlantic, from the Faeroe Islands to the Azores, from depths of 944 to 1829 m (Hoek 1883, 1913; Pilsbry 1916; Gruvel 1920; Southward & Southward 1958; Utinomi 1965; Newman & Ross 1971). The present samples are from 570 to 940 m, and occur on rocks and on echinoid spines. *Bathylasma hirsutum* was redescribed in detail by Newman & Ross (1971).

Genus *Hexelasma* Hoek, 1913

Hexelasma americanum Pilsbry, 1916
(Figs 1, 20-21)

Hexelasma americanum Pilsbry, 1916: 330, pl. 69. – Utinomi 1965: 12.

Aaptolasma americanum – Newman & Ross 1971: 161, pl. 22a-b, 36-37; 1976: 46.

MATERIAL EXAMINED. — Stn 180, 1 specimen, with the shell plates disarticulated (lacking one latera), MNHN Ci 2599.

DESCRIPTION

Shell conic, color white or pale orange, aperture toothed. Plates (Fig. 20A, B) with spaced and conspicuous growth lines; cuticle persistent only on opercular plates, in larger specimens, pilose along growth lines; alae well developed, with fine lines, radii absent; basal margin of wall sometimes undulated. Sheath (Fig. 20B) adpressed, well defined. Internally (Fig. 20B) lamina with thin longitudinal striae; spaces between striae covered by chitin in larger specimens. Carino-lateral narrow, 0.13 width of carina and 0.22 width of lateral.

Scutum (Fig. 20C) higher than wide, height 1.4 to width; apex recurved outwards, tergal segment narrow, with wide and strong longitudinal

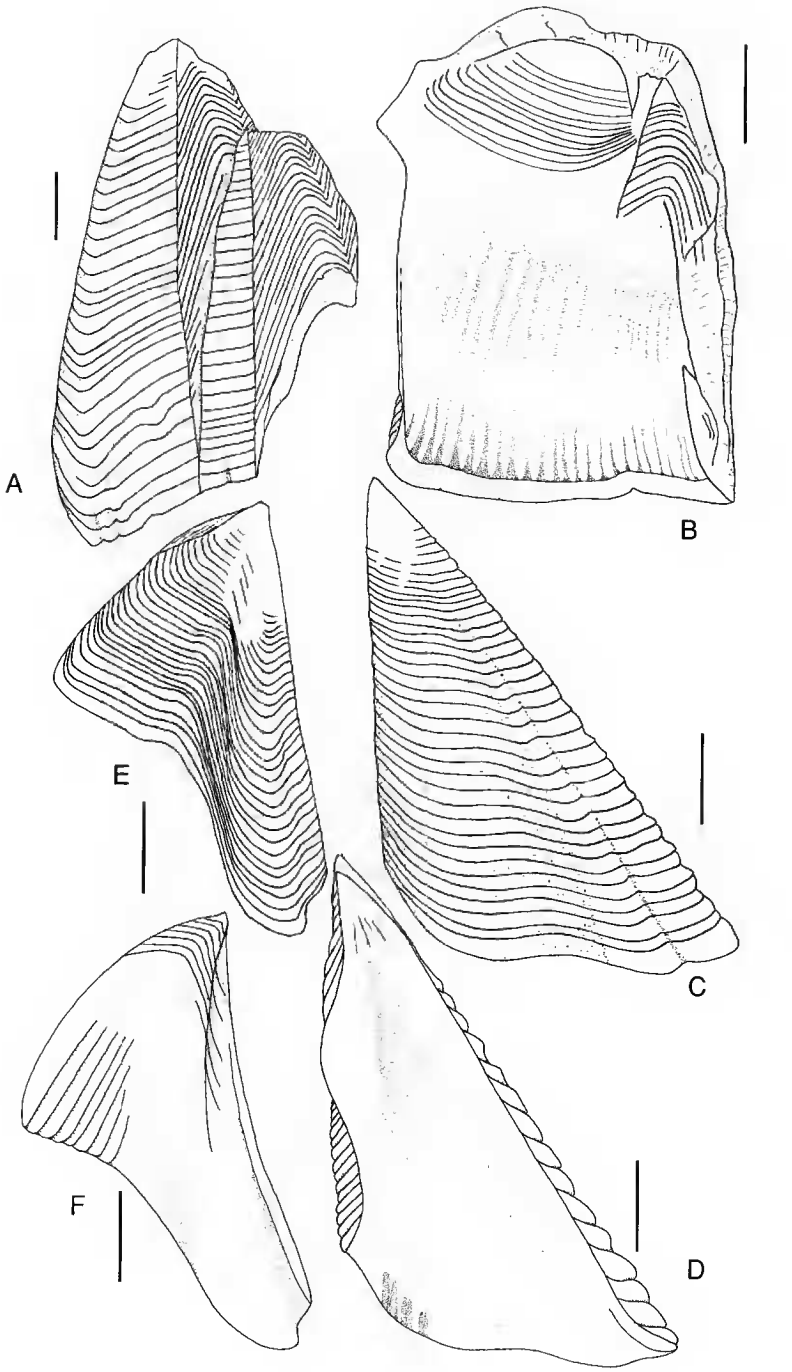

FIG. 20. — *Hexelasma americanum* Pilsbry. **A**, lateral view of carina and carino-lateral; **B**, lateral, internal view; **C**, **D**, scutum, external and internal view; **E**, **F**, tergum, external and internal view. Scale bars: A, B, 0.3 mm; C-F, 0.2 mm.

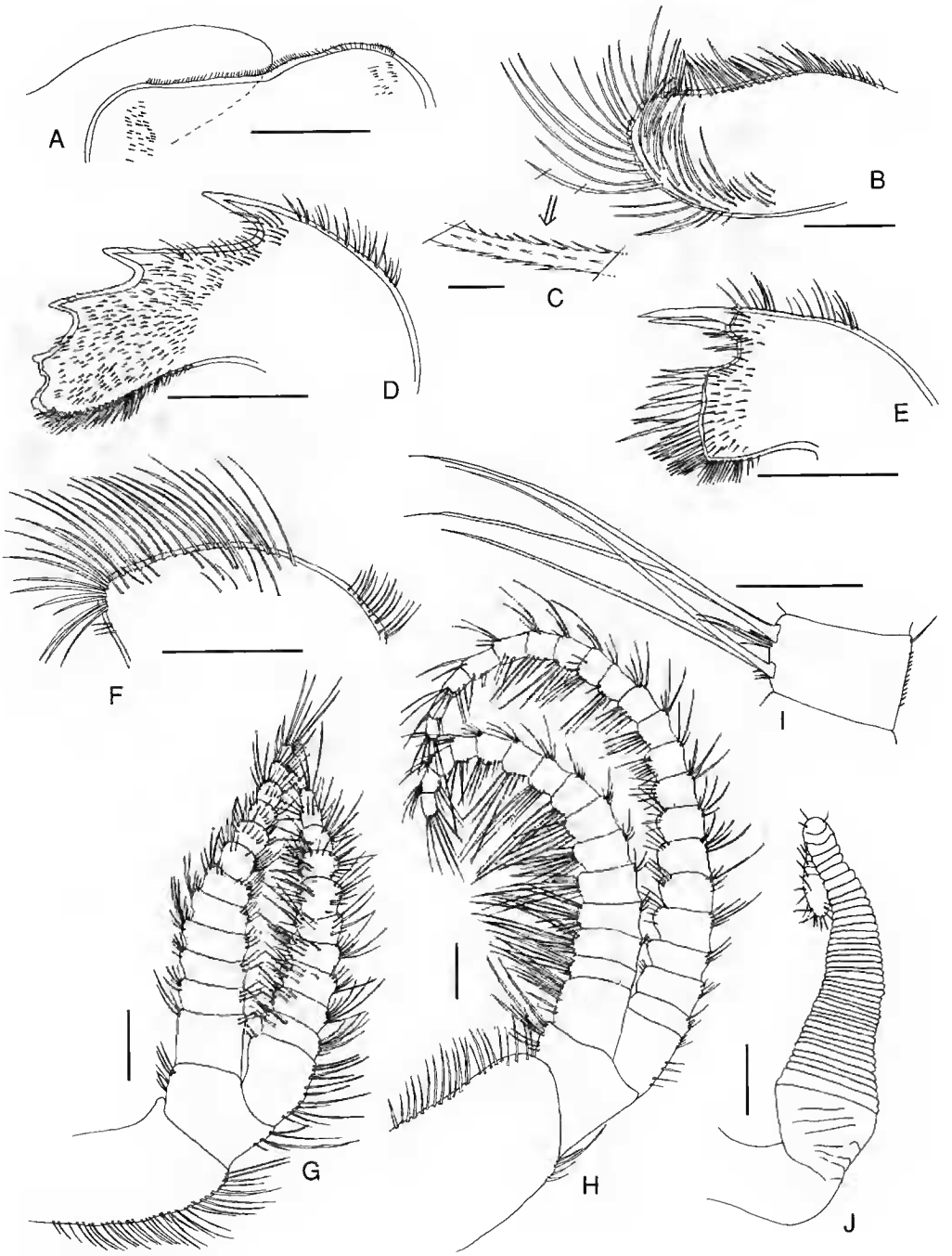

FIG. 21. — *Hexelasma americanum* Pilsbry. **A**, labrum and palp; **B**, palp; **C**, detail of the palp setae; **D**, mandible; **E**, maxilla I; **F**, maxilla II; **G**, cirrus I; **H**, cirrus II; **I**, intermediate article of cirrus VI; **J**, penis. Scale bars: A, B, D-J, 0.5 mm; C, 0.02 mm.

apico-basal rib near occludent margin; articular margin straight, basal margin sinuous; occludent margin straight; growth lines conspicuous and elevated. Internally (Fig. 20D), adductor ridge absent, articular ridge rounded, medial to articular margin; forming shallow articular furrow; six lateral depressor muscle crests poorly developed; articular and occludent margins thickened, leaving depressed triangular area medially.

Tergum (Fig. 20E, F) triangular, with spur near basi-scutal angle, spur furrow open; spur distally rounded, curving continuously to basal margin; eight crests for depressor muscles, projecting; articular ridge elevated, not curved.

Labrum (Fig. 21A) hirsute, lacking teeth, with shallow medial concavity. Palp (Fig. 21B, C) club-shaped, large, with numerous fine pectinate setae. Mandible (Fig. 21D) with four teeth, distance between first and second twice that between second and third, second to fourth with subsidiary cusps, lower angle obtuse. Maxilla I (Fig. 21E) with two large spines followed by conspicuous, large notch, twelve to thirteen moderate and eight to nine small spines along cutting edge. Maxilla II (Fig. 21F) triangular, with long simple setae.

Cirrus I (Fig. 21G) with subequal rami, anterior ramus slightly longer than posterior; both with protuberant articles covered by long simple setae, distally with fine pinnate setae. Cirrus II (Fig. 21H) with equal rami, articles protuberant, with clusters of simple setae on protuberance and distal angle; distal articles with fine pinnate setae. Cirri III-VI with equal rami. Intermediate article of cirrus VI (Fig. 21I) with length 0.60 width, with two pairs of long, fine, pinnate setae on anterior margin, small setulae below these pairs; one or two short simple setae on posterior angle, small scales on posterior margin. Penis (Fig. 21J) short, annulated, setuale on distal portion. Number of articles of cirri I-VI is presented in table 9.

TABLE 9. — Number of articles of cirri I-VI of *Hexelasma americanum* Pilsbry, stn 180. **I-VI**, cirri I to VI; **RC**, right cirri; **LC**, left cirri.

	I	II	III	IV	V	VI
RC	12/11	15/20	29/29	43/44	47/49	46/49
LC	13/13	13/24	16+/33	37/41	48/42	46/50

REMARKS

Foster (1981) considered *Aaptolasma* Newman & Ross synonymous with *Hexelasma* Hoek and proposed an emended diagnosis. His diagnosis stated that the scutum and tergum have no articular ridge, but a tergal ridge is present on the tergum of *H. americanum*. Therefore, Foster's diagnosis has to be emended to include the tergal articular ridge as absent or present.

Hexelasma americanum is the only species of this genus recorded from the Atlantic. It was collected off South Carolina, Blake Plateau, between 512 and 770 m (Pilsbry 1916; Newman & Ross 1971).

The specimen dredged by the *Jean Charcot* Expedition is similar to that described by Pilsbry (1916) and Newman & Ross (1971) except for the following characters: The shell has a pilose cuticle, the spur of the tergum is distally rounded, the mandible has an obtuse angle and the penis has setulae at the distal portion. These characters may be individual variations due the very few number of specimens described. Pilsbry (1916) described only one complete and three incomplete specimens, and herein I add another specimen. All of the other characters of the shell, opercular plates and cirri agree with the descriptions by Pilsbry (1916) and Newman & Ross (1971), including the details on the growth lines of the plates described by the latter.

The record of this species from the Azores greatly expands the distribution of *Hexelasma americanum* (Fig. 1). The depth range of this species is extended from 770 to 1235-1069 m.

Family TETRACLITIDAE Gruvel, 1903
Genus *Tesseropora* Pilsbry, 1916

Tesseropora arnoldi n.sp.
(Figs 22-23)

? *Tetraclita squamosa* var. *elegans* – Baker 1967: 46 (not *T. squamosa elegans* Darwin,1854).

MATERIAL EXAMINED. — Holotype: stn P9, 1 broken specimen, rc: 0.7 mm, MNHN Ci 2520.

Paratypes: stn L9, 1 broken specimen, MNHN

Ci 2544. — Stn L11, 6 specimens, rc: 0.2-0.4 cm, MNHN Ci 2545, USNM 282803, MNRJ 8921. — Stn P29, 15 specimens, rc: 1.0-4.0 mm, MNHN Ci 2531, MNRJ 8922. — Stn 216, 5 empty shells, 0.3- 0.5 mm, MNHN Ci 2621.

ETYMOLOGY. — Named in honor of Dr Arnold Ross, in appreciation of his contributions to our knowledge of the Tetraclitoidea.

DIAGNOSIS

Shell and sheath white; radii incomplete; tubes irregular, radially lengthened, with striae on inner side of outer lamina. Scutum higher than wide, adductor ridge separated from articular ridge. Labrum hairy; three or four conspicuous teeth on each side of medial notch. Intermediate article of cirrus VI with four pairs of setae on anterior margin.

DESCRIPTION

Shell (Fig. 22A, B) conic, white, aperture smooth or little toothed, cuticle usually persistent, when present finely pilose. Plates with uniformly thin ribs, growth lines thin; alae developed, smooth; radii incomplete, best developed in lateral plate. Sheath (Fig. 22C) adpressed, well defined. Inner lamina with thin longitudinal striae in small specimens to well developed striated ribs over septa in larger ones. Tubes irregular, radially lenghtened, with striae on inner side of outer lamina. Base calcareous, thin.

Scutum (Fig. 22D) higher than wide, straight, growth lines conspicuous; articular and basal margins convex, occludent margin straight and toothed. Internally, adductor ridge thin, well developed, apical portion separated from articular ridge; articular ridge long, almost length of articular margin, articular groove shallow; rostral and lateral muscle depressor pits conspicuous, shallow, five rostral and lateral depressor crests, adductor muscle pit small, rounded, supramedial.

Tergum (Fig. 22E) elongated, with spur near basi-scutal angle, distal end rounded, curving continuously to basal margin; longitudinal furrow open and broad; six crests for depressor muscles prominent; articular ridge slightly prominent in upper portion.

Labrum (Fig. 23A) hairy; three or four conspicuous teeth on each side of shallow medial notch. Palp (Fig. 23B) club-shaped, large, with numerous fine pectinate setae on upper margin. Mandible (Fig. 23C) with five teeth, second to fourth with conspicuous subsidiary cusps, especially fourth; strongly denticulated between fourth and fifth and at lower angle. Maxilla I (Fig. 23D) with one or two large spines followed by a conspicuous notch, seven to nine moderate and five to seven small spines along cutting border; in notch small spines seldom present. Maxilla II (Fig. 23E) bilobed with long simple setae.

Cirrus I (Fig. 23F) with subequal rami, anterior twice length of postetior; posterior one with protuberant articles; articles of both rami covered by several long, simple, fine, pinnate setae. Cirrus II (Fig. 23G) with equal rami, articles protuberant, clothed with simple, fine pinnate setae; protopodite with plumose setae. Cirrus III (Fig. 23H) with anterior ramus 1.35 length of posterior, articles with numerous bipectinate setae, few simple and pinnate setae and multifid scales near setae (Fig. 23I-K); protopodite with plumose setae (Fig. 23L). Cirri IV-VI with rami of equal length. Intermediate article of cirrus VI (Fig. 23M) equidimensional, four pairs of setae on anterior margin, one to four simple setae on postetior angle. Penis short, annulated, with few setuale. Number of articles of cirri I-VI is presented in table 10.

TABLE 10. — Number of articles of cirri I-VI of *Tesseropora arnoldi* n.sp. (Holotype). **I-VI**, cirri I to VI; **RC**, right cirri; **LC**, left cirri.

	I	II	III	IV	V	VI
RC	9/6	6/6	10/8	16/15	13/15	16/17
LC	9/5	6/6	10/7	16/16	13/14	16/16

REMARKS

Tesseropora atlantica was previously the only species of this genus recorded from the Atlantic Ocean, having been reported from Bermuda and the Azores (Newman & Ross 1977) and on Saint Paul Rocks (Edwards & Lubbock 1983a, b). The description of Newman & Ross (1977) appears to be based exclusively on the Bermuda specimens, including all of their figures. But, in their

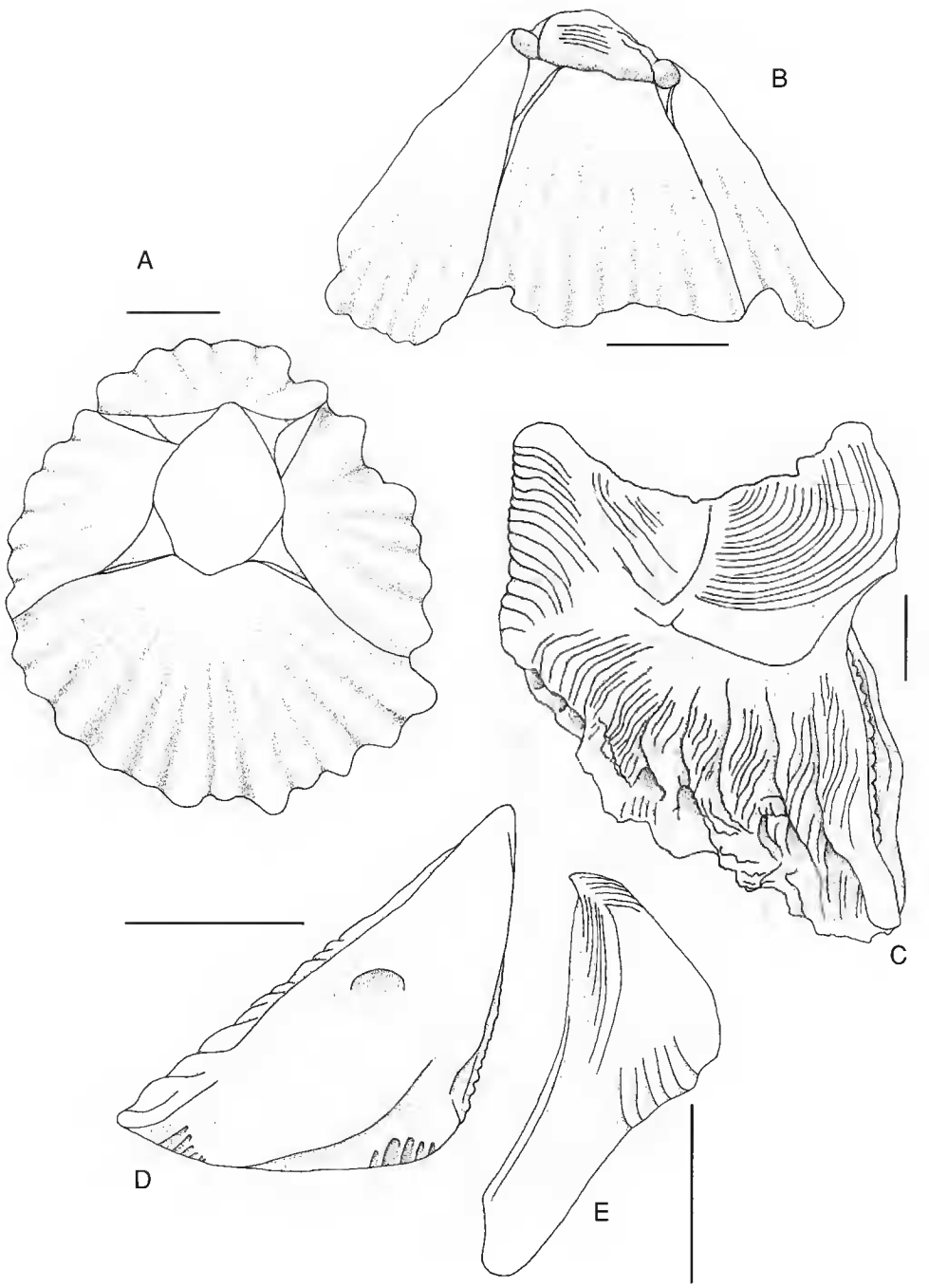

FIG. 22. — *Tesseropora arnoldi* n.sp. **A**, **B**, paratype (stn 216); **A**, top view; **B**, lateral view; **C**, **D**, holotype, **C**, lateral, internal view; **D**, **E**, scutum and tergum, internal view. Scale bars: 1 mm.

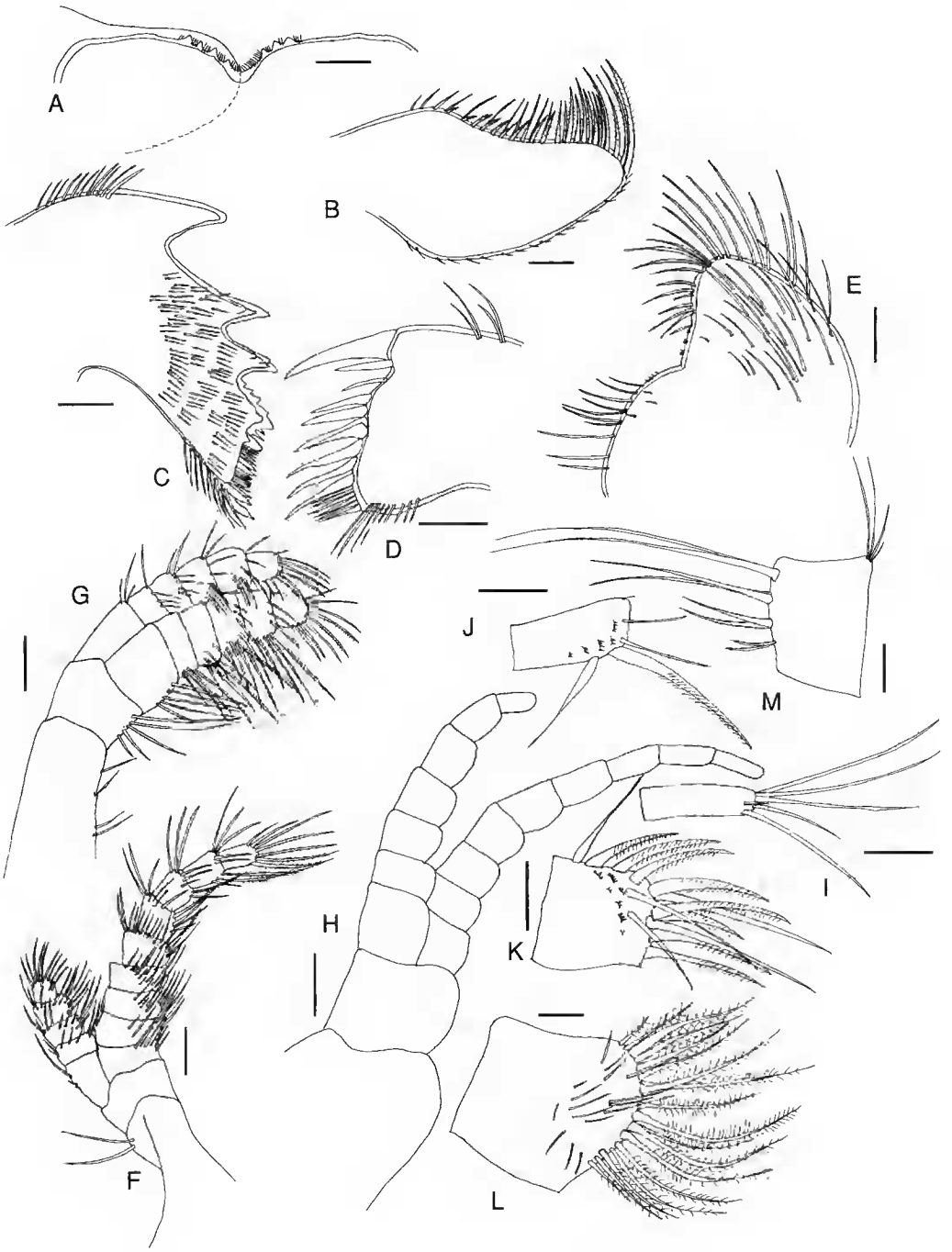

FIG. 23. — *Tesseropora arnoldi* n.sp. **A**, labrum and palp; **B**, palp; **C**, mandible; **D**, maxilla I; **E**, maxilla II; **F**, cirrus I; **G**, cirrus II; **H**, cirrus III; **I-K**, detail of articles of anterior ramus of cirrus III; **L**, detail of article of protopod of ramus III; **M**, intermediate article of cirrus VI. Scale bars: A-E, I-M, 0.05 mm; F-H, 0.1 mm.

material examined, they cite the specimens studied by Baker (1967) from the Azores.

The samples from the *Jean Charcot* Expedition show that the species of *Tesseropora* from the Azores is conspicuously distinct from that described from Bermuda. The inner lamina of the plates have ribs well developed continuously from the base to the sheath, intercalated by numerous fine ribs, instead of only small numerous fine ribs. The adductor ridge of the scutum is removed from the articular ridge, whereas *T. atlantica* has the adductor ridge continuous with the articular ridge. The labrum has conspicuous teeth on the crest, contrary to the lack of teeth in *T. atlantica*. The articles of cirrus III have multifid scales and no curved spines or denticles on the anterior margin. The intermediate articles of cirrus VI have only four pairs of paired setae, instead of five pairs as in *T. atlantica*.

The specimens examined are smaller than those observed by Newman & Ross (1977); most are about 5 mm in carino-rostral diameter and only one specimen is 7 mm.

Tesseropora arnoldi n.sp. can be distinguished from Pacific *Tesseropora* [*T. rosea* (Krauss) and *T. wireni* (Nillson-Cantell)], by the color of the sheath, the development of the radii and the parietal tubes and the structure of the cirri. *Tesseropora rosea* has the sheath dirty white tinted pink; the radii are moderately wide, and the intermediate articles of cirrus VI have three pairs of setae and numerous short setae in dense bunches below the two major pairs (Newman & Ross 1977). *T. wireni* has the sheath usually pink; the parietal tubes are divided into secondary and tertiary rows basally, and the intermediate articles of cirrus VI have three pairs of setae and a few short setae in dense bunches below the two major pairs (Newman & Ross 1977).

Tesseropora arnoldi n.sp. was collected intertidally to about 25 m depth, usually attached to *Megabalanus azoricus* and mollusc shells. Several samples were taken in the Azores in intertidal and shallow waters, but the species was not common in these samples. It was collected only on Faial and São Miguel Islands. All the dissected specimens were incubating nauplii. Baker (1967) observed that *Tetraclita squamosa* var. *elegans* Darwin (? = *T. arnoldi* n.sp.) was "very abundant in a single situation at Urzelina in 1 m. of water" at São Jorge Island.

Family BALANIDAE Leach, 1817
Genus *Balanus* Da Costa, 1778

Balanus trigonus Darwin, 1854

Balanus trigonus Darwin, 1854: 223, pl.3, fig. 7a-f. – Pilsbry 1916: 111, pl. 26, figs 1-13e (synonymy). – Baker 1967: 47.

MATERIAL EXAMINED. — Stn L8, 1 specimen, MNHN Ci 2542. — Stn P3, 1 specimen, MNHN Ci 2508. — Stn P4, 1 specimen, MNHN Ci 2510. — Stn P6, 31 specimens, MNHN Ci 2512. — Stn P7, > 170 specimens, MNHN Ci 2514, MNRJ 8923. — Stn P8, shells fragments, MNHN Ci 2517. — Stn P9, 5 empty shells, MNHN Ci 2519. — Stn P14, 31 specimens, MNHN Ci 2524. — Stn P15, 10 specimens, MNHN Ci 2546. — Stn P17, 25 specimens, MNHN Ci 2652. — Stn P29, 2 specimens, MNHN Ci 2530. — Stn P34, 1 specimen, MNHN Ci 2533. — Stn P41, 6 specimens, MNHN Ci 2661. — Stn 1, more than 160 specimens, MNHN Ci 2548, MNRJ 8924. — Stn 10, 5 empty shells, MNHN Ci 2552. — Stn 11, 2 empty shells, MNHN Ci 2553. — Stn 60, 8 empty shells, MNHN Ci 2557. — Stn 143, more than 100 specimens, MNHN Ci 2574.

REMARKS

Balanus trigonus has a world-wide distribution, and is widespread in the Eastern Atlantic, occurring from the Mediterranean African coast to South Africa (Stubbings 1967). It was previously recorded from the Azores by Baker (1967) and Young (in press).

Genus *Megabalanus* Hoek, 1913

Megabalanus azoricus (Pilsbry, 1916)

Balanus tintinnabulum azoricus Pilsbry, 1916: 62, figs 8, 11c, pl. 12, figs 2-2b. – Baker 1967: 46.

Megabalanus azoricus – Newman & Ross 1976: 67. – Henry & McLaughlin 1986: 21, figs 1a, 3d-e, 6a-d.

MATERIAL EXAMINED. — Stn L9, 10 specimens, rc: 0.4-2.7 cm, MNHN Ci 2543, MNRJ 8925. — Stn P7, 3 specimens, rc: 1.6-2.8 cm, MNHN

Ci 2515. — Stn P38, 7 specimens, rc: 2.8-3.8 cm, MNHN Ci 2534, MNRJ 8926. — Stn P41, 2 specimens, rc: 2.9 cm, MNHN Ci 2535. — Stn 186, more than 50 empty shells, rc: 0.5-3.5 cm, MNHN Ci 2602. — Stn 216, 1 empty shell, rc: 3,1 cm, MNHN Ci 2620.

REMARKS

The wall and opercular plates of *M. azoricus* were redescribed by Henry & McLaughlin (1986) who reported it from the Azores and St. Helena Island. The type locality of this species is Terceira Island (Pilsbry 1916), but it is also reported from São Jorge Island (Baker 1967). The *Jean Charcot* sampled this species from the Faial and São Miguel Islands and, also, off Santa Maria Island. Therefore, this species appears to be well distributed in the Azores Archipelago, from the intertidal to infralittoral zones. The record from 80-90 m off Santa Maria Island is based on one empty eroded shell, which probably fell down to this depth.

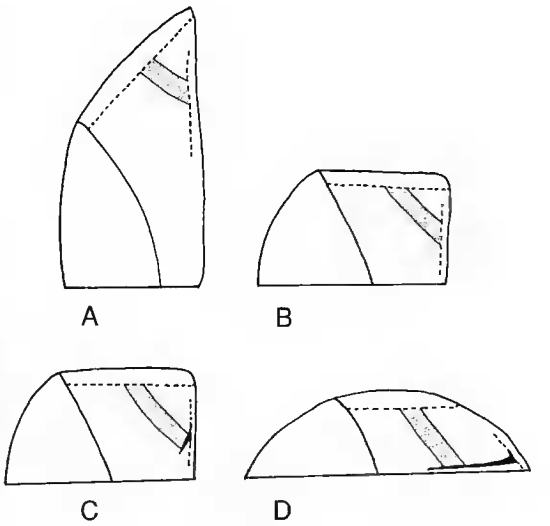

FIG. 24. — Schematic representation of the relative position of the opercular plates and size of the adductor ridge of selected genera of Verrucidae, viewed from rostral side. **A**, *Altiverruca*; **B**, *Newmaniverruca* n.g.; **C**, *Metaverruca*; **D**, *Verruca* s.s.

THE GENERIC REVISION OF THE VERRUCIDAE
(Figs 24-25)

REMARKS

Pilsbry (1916) proposed four sections to separate the genus *Verruca*, i.e., *Metaverruca*, *Verruca*, *Cameraverruca* and *Altiverruca*. He also described four species groups in the *Verruca* section, *viz*: group of *V. stroemia*, *V. alba*, *V. nexa* and *V. calotheca*. All of the characters in this arrangement were based almost wholly on the structure of the shell. He also included some differences on the relative lengths of the rami of cirri I to III.

All of Pilsbry's sections have subsequently been accorded generic status (Zevina 1978), and the following genera *Rostrataverruca* Broch, 1922, *Brochiverruca* Zevina, 1993b and *Spongoverruca* Zevina, 1987a have been added to the Verrucidae (Broch 1931; Zevina 1987a, 1993b; Buckeridge 1994). *Rostratoverruca* encompasses the *V. nexa* group recognized by Pilsbry (1916).

Young (in press) questions the validity of the genus *Metaverruca*, since many of its diagnostic characters are present in other genera. Additionally the presence of a myophore, the most used feature to characterize this genus, is also well developed in *V. stroemia*, the type species of *Verruca*.

Buckeridge (1997) recognized the problem of the myophore as a diagnostic character, but proposed maintaining the genus, and added new characters for the diagnosis. Besides the thickened basal ledge, the well developed myophore, and the top flattened as described by Pilsbry (1916), he added the box-like shape of the shell, and a D-shaped orifice as diagnostic for this genus.

The greatest problem defining the genera within the Verrucidae is the diagnosis of *Verruca* s.str. Pilsbry (1916) diagnosed this genus as "Top flattened, the plane of the movable plates not far from parallel with that of the base; radio-alar area between parieties of fixed scutum and tergum small and linear". Buckeridge (1994) defined this genus as "Verrucids with apices of rostrum and carina marginal; fixed scutum without myophore; operculum parallel to base." The diagnosis of Buckeridge (1994: 90) is in error when he cites the absence of a myophore since *V. stroemia*, type species of *Verruca*, has a well developed myophore, as do several other *Verruca* species.

With the reassigment of many species of *Verruca* s.l. to other genera (*Metaverruca*, *Rostratoverruca*, *Cameraverruca*, etc.), the species which remain in *Verruca* s.s. do not appear to be closely related. In studying the shell characters of several species of *Verruca* s.s., two transformation series can be observed.

The first transformation series is based on the shape of the shell and the development of the myophore[2] (Fig. 24). The first stage of development is attained in the species of *Altiverruca*. This is characterized by a steep shell with the opercular plates nearly parallel to the fixed scutum and tergum (Fig. 24A). The adductor muscles are attached directly to the inner side of the wall, without the scutum lacking an adductor ridge and also with a poorly developed adductor pit.

If we compare this pattern with an outgroup reference, the lepadomorphs, this character can be considered plesiomorphic in the verrucids. Both scuta of the lepadomorphs are usually parallel, and fail to develop an adductor ridge.

Considering the steep pattern of *Altiverruca* as plesiomorphic, an evolutionary trend can be vizualized when the shell becomes more inclined and flatter, which implies a change in the relative position between the movable scutum and fixed-scutum: The angle between these plates enlarges from narrowly acute to a right angle (Fig. 24A, B). The change in position of these plates also necessitates a change in the attachment of the adductor muscle. The development of the adductor ridge ranges from a small low ridge to a projecting tongue-myophore (e.g. *V. stroemia*; Fig. 24C, D). The development of an adductor ridge makes it possible to maintain the same area for muscle fixation.

The other transformation series is in the development of the secondary ridges on the rostrum and the carina, directed toward the opercular valves. The supposedly plesiomorphic position of the umbos is marginal (apical), with a linear hinge line between the movable opercular valves and the rostrum-carina, as can be observed in basal pedunculates (Fig. 25A). This stage is seen in several species included in *Verruca* s.l. (e.g. *V. entobapta*, *V. albatrossiana*, *V. scrippsae*).

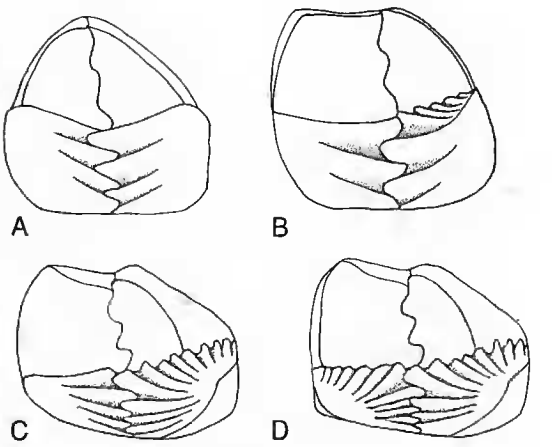

Fig. 25. — Schematic representation of the rostra and carina ridges of selected genera of Verrucidae, viewed from rostro-carinal side. **A**, *Newmaniverruca* n.g.; **B**, *Costatoverruca* n.g.; **C**, *Rostratoverruca*; **D**, *Brochiverruca*.

The secondary ridges are first developed on the rostrum, beginning at the umbo and moving up to the scutum basis (Fig. 25B). This state is also seen in some species of *Verruca* s.l. (*V. alba*, *V. xanthia*, *V. floridana*). The umbo of the rostrum is displaced from the margin (Fig. 25C). The species with this state comprise the genus *Rostratoverruca*. Subsequently, the umbo of the carina is also displaced from the margin (Fig. 25D), which is representative of the species of *Brochiverruca*.

Based on these considerations, I propose dividing *Verruca* into three genera: *Newmaniverruca* n.g., *Costatoverruca* n.g. and *Verruca* s.s. *Newmaniverruca* n.g. contains the box-like species with the opercular plates nearly parallel to the basis, with marginal umbos of rostrum and carina, without any secondary ridges and without a myophore. *Costatoverruca* n.g. encompasses the box-like species with the opercular plates nearly parallel to the basis, secondary ridges developed on the rostrum, and rarely with an adductor ridge or myophore. *Verruca* s.s. contains the derived species with the shell flattened, the opercular

2. Sometimes, it is difficult to define the limits between "adductor ridge" and "myophore". The myophore is defined as a "tongue-shaped adductor ridge" (Pilsbry 1916: 21).

valves parallel, and the myophore strongly developed.

Therefore, *Metaverruca* is redefined to include the box-like species with a well developed myophore, without secondary ridges on the fixed rostrum. Also, the adults develop a ledge at the base of the wall.

The genus *Spongoverruca* was described to isolate *V. spongicola*, which lives in sponges. Gruvel (1911, 1912b) presented a short description with no diagnostic character that allows the separation of this species in a new genus, appart from being the only species occurring in sponges. The perpendicular position of the opercular valves in relation to the basis mandates inclusion of this species in *Altiverruca*. Although Buckeridge (1994: 89) questioned the validity of this genus, I consider *Spongoverruca* as a synonym of *Altiverruca*.

Broch (1931: 45) presented the name *Eu-verruca* as a subgenus of *Verruca* to separate in the following way *Verruca* s.str. from the other subgenera he described. He justified this new name due to "The central group of the genus is better marked by fixing the prefix Eu- to the genus name than using the latter alone; this may serve to bring confusion about." Therefore *Euverruca* is an objective synonym of *Verruca*.

Key to the genera of the family Verrucidae

1a. Form erect; opercular plates perpendicular to base; without adductor ridge or myophore on fixed-scutum ..... *Altiverruca*
1b. Form not erect; opercular plates at no more than 45° to base; with or without adductor ridge or myophore on fixed-scutum 2

2a. Fixed tergum and rostrum medially expanded, forming internal partitioned cavities; opercular plates 45° to base; with adductor ridge on movable scutum ..... *Cameraverruca*
2b. Fixed tergum and rostrum not medially expanded, without internal cavities; opercular plates less than 45° to base; without adductor ridge on movable scutum 3

3a. Shell box-like; opercular plates proportionally large, their width one half or more the width of shell; with or without myophore 4
3a. Shell flattened; opercular plates proportionally small, their width less than one half the width of shell; with a strong myophore ..... *Verruca*

4a. Umbo of rostrum and carina marginal 5
4b. Umbo of rostrum not marginal, umbo of carina marginal or displaced from margin 6

5a. Rostrum without secondary ridges directed toward tergal base; without myophore; basal margin of shell not thickened ..... *Newmaniverruca* n.g.
5b. Rostrum with secondary ridges; with or without myophore; basal margin of shell not thickened ..... *Costatoverruca* n.g.
5c. Rostrum without secondary ridges directed toward tergal base; with myophore; basal margin of shell thickened ..... *Metaverruca*

6a. Umbo of rostrum displaced from margin ..... *Rostratoverruca*
6b. Umbo of rostrum and carina displaced from margin ..... *Brochiverruca*

Genus *Altiverruca* Pilsbry, 1916

Verruca Section D: *Altiverruca* Pilsbry, 1916: 40.

Verruca (*Altiverruca*) – Broch 1931: 45. – Foster 1978: 68.

Altiverruca – Zevina 1987a: 1813. – Buckeridge 1994: 92.

Spongoverruca Zevina, 1987a: 1813.

TYPE SPECIES. — *Verruca hoeki* Pilsbry, 1907a, by original designation (Pilsbry, 1916: 40), Recent, Anegada Passage, 18°30'N - 63°31'W, 496 fathoms.

SPECIES INCLUDED. — *A. gibbosa* (Hoek, 1883), *A. incerta* (Hoek, 1883), *A. nitida* (Hoek, 1883), *A. quadrangularis* (Hoek, 1883), *A. obliqua* Hoek, 1883, *A. sulcata* (Hoek, 1883), *A. crenata* (Aurivillius, 1898), *A. costata* (Aurivillius, 1898) n. comb. (?= *A. gibbosa*), *A. inermis* (Aurivillius, 1898) n. comb., *A. erecta* (Gruvel, 1900b), *A. longicarinata* (Gruvel, 1900b), *A. cristallina* (Gruvel, 1907), *A. plana* (Gruvel, 1907), *A. mitra* (Hoek, 1907b) (= *A. gibbosa*), *A. darwini* (Pilsbry, 1907a) (= *A. gibbosa*), *A. hoeki* (Pilsbry, 1907a) (= *V. quadrangularis*), *A. joubini* (Gruvel, 1912a), *A. cassis* (Hoek, 1913) (= *A. cristallina*), *A. casula* (Hoek, 1913), *A. navicula* (Hoek, 1913), *A. bicornuta* (Pilsbry, 1916) (= *A. gibbosa*), *A. rathbuniana* Pilsbry, 1916 (= *A. gibbosa*), *A. cristallina laevis* (Broch, 1922) (= *V. cristallina*), *A. ornata* Nilsson-Cantell, 1929, *A. regularis* Nilsson-Cantell, 1929, *A. gibbosa somaliensis* (Nilsson-Cantell, 1929) (= *A. gibbosa*), *A. allisoni* (Rao *et* Newman, 1972), *A. aves* (Zevina, 1975), *A. angustiterga* Zevina, 1987a, *A. galapagosa* Zevina, 1987a, *A. gira* (Zevina, 1987b), *A. sculpturata* Zevina, 1987a, *A. sublima* Zevina, 1987a, *A. longa* Zevina, 1988, *A. tchesunovi* Zevina, 1988, *A. vitrea* Zevina, 1988, *A. galkini* Zevina, 1990, *A. mollae* Zevina, 1990, *A. beringiana* Zevina *et* Galkin, 1992, *A. laeviscuta* Buckeridge, 1994, *A. vertica* Foster *et* Buckeridge, 1995a (= *A. obliqua*) and *A. spongicola* (Gruvel, 1911) n. comb.

DIAGNOSIS

Form erect; opercular plates erect, perpendicular to base; fixed scutum without adductor ridge or myophore; suture between rostrum and carina from linear to imbricate; bases of plates not inflected.

REMARKS

In this genus I include *V. inermis* Aurivillius, 1898, which is described in detail by Gruvel (1920). Its steep pattern of growth, poorly developed imbricating suture between the rostrum and the carina places this species in *Altiverruca*. Due to the placement of *Spongoverruca* as a junior subjective synonym of *Altiverruca*, I have also included *Spongoverruca spongicola* (Gruvel, 1911).

Genus *Cameraverruca* Pilsbry, 1916

Verruca Section C: *Cameraverruca* Pilsbry, 1916: 39.

Verruca (*Cameraverruca*) – Foster 1978: 68.

Cameraverruca – Zevina 1987a: 1813. – Buckeridge 1994: 103.

TYPE SPECIES. — *Verruca euglypta* Pilsbry, 1907a, by original designation (Pilsbry, 1916: 39), Recent, off Fernandina, Florida, 30°44'N, 79°26'W, 440 fathoms.

SPECIES INCLUDED. — *C. euglypta* Pilsbry, 1907a, *C. nodiscuta* Buckeridge, 1994.

DIAGNOSIS

Form with opercular plates forming angle of 45° with base; apical cavities of fixed tergum and rostrum partitioned off, forming recesses of general body cavity. Movable scutum with adductor ridge.

Genus *Newmaniverruca* n.g.

Verruca Section B: *Verruca*, Group of *Verruca alba* Pilsbry, 1916: 25 (in part).

Verruca Section B: *Verruca*, Group of *Verruca calotheca* Pilsbry, 1916: 30 (in part).

Verruca (*Verruca*) – Foster 1978: 68 (in part). – Zevina 1987a: 1812 (in part). – Buckeridge 1994: 90 (in part).

TYPE SPECIES. — *Verruca albatrossiana* Pilsbry, 1912; Recent, east of Luzon, Philippines, 310 fathoms.

SPECIES INCLUDED. — *N. imbricata* (Gruvel, 1900b), *N. radiata* (Gruvel, 1901), *N. multicostata* (Gruvel, 1907), *N. albatrossiana* (Pilsbry, 1912), *N. barbadensis* (Pilsbry, 1916), *N. entobapta* (Pilsbry, 1916), *N. flavidula* (Pilsbry, 1916), *N. grex* (Hoek, 1913) (= *N. albatrossiana*) and, *N. scrippsae* (Zullo, 1964).

ETYMOLOGY. — Named in honor of Dr William A. Newman, who is largely responsible for my studies

on cirripeds, and for his interesting discussions about barnacles.

DIAGNOSIS

Form box-like, opercular plates parallel or almost parallel with base; umbo of carina and rostrum marginal, without secondary ridges and myophore.

REMARKS

The species *N. albatrossiana* (Pilsbry, 1912) is designated herein as the type species of *Newmaniverruca* n.g. because it is the first well recognised species. The species described by Gruvel (*N. imbricata*, *N. radiata*, and *N. multicostata*) are too briefly described and have not been collected again (Gruvel 1900b, 1901, 1907).

I am assigning specific status to the subspecies of *calotheca* and *alba*, because many of these subspecies become separated at the generic level (*Newmaniverruca* n.g. and *Costatoverruca* n.g.) in the classification formulated here. The species described by Gruvel are tentatively included in this genus by the absence of the secondary ridges on the rostrum; no information was cited on the internal surface of the fixed-scutum.

KEY TO SPECIES :

1a. Shell with conspicuous radial ridges directed toward the base of the plates 2
1b. Shell without radial ridges on the plates, only those directed to the rostrum-carina articulation 3

2a. Rostral area of scutum smooth; carina smaller than rostrum ..... *N. multicostata* (Gruvel)
2b. Rostral area of scutum transversely grooved; carina larger than rostrum ..... *N. albatrossiana* (Pilsbry)

3a. Opercular plates nearly parallel with base of shell 4
3b. Opercular plates forming an angle with base of shell ..... *N. flavidula* (Pilsbry)

4a. Tergum with three articular ridges ..... *N. barbadensis* (Pilsbry)
4b. Tergum with four articular ridges 5
4c. Tergum with five articular ridges ..... *N. imbricata* (Gruvel)

5a. Scutum with three articular ridges ..... *N. scrippsae* (Zullo)
5b. Scutum with four atticular ridges 6

6a. All four articular ridges well developed ..... *N. entobapta* (Pilsbry)
6b. Only the two lower articular ridges well developed ..... *N. radiata* (Gruvel)

Genus *Costatoverruca* n.g.

Verruca Section B: *Verruca*, Group of *Verruca alba* Pilsbry, 1916: 25 (in part).

Verruca Section B: *Verruca*, Group of *Verruca calotheca* Pilsbry, 1916: 30 (in part).

Verruca (*Verruca*) – Foster 1978: 68 (in part). – Zevina 1987a: 1812 (in part). – Buckeridge 1994: 90 (in part).

TYPE SPECIES. — *Verruca alba* Pilsbry, 1907a; Recent, Straits of Florida, 24°25'45"N - 81°46'45"W, 45 fathoms.

SPECIES INCLUDED. — *C. cornuta* (Aurivillius, 1898), *C. alba* (Pilsbry, 1907a), *C. calotheca* (Pilsbry, 1907a), *C. grimaldi* (Gruvel, 1912a), *C. caribbea* (Pilsbry, 1916), *C. heteropoma* (Pilsbry, 1916), *C. floridana* (Pilsbry, 1916), *C. xanthia insculpta* (Pilsbry, 1916), *C. xanthia* (Pilsbry, 1916), *C. niasiensis*

(Nilsson-Cantell, 1929), *C. pacifica* (Buckeridge, 1994), and *C. sinuosa* (Foster *et* Buckeridge, 1995b).

ETYMOLOGY. — from the Greek *costata* (ridge), referring to the presence of secondary ridges on the rostrum.

DIAGNOSIS

Form box-like, opercular plates parallel or almost parallel with base; umbo of carina and rostrum marginal, rostrum with secondary ridges, seldom on carina; with pit for adductor muscle, usually adductor ridge or myophore.

REMARKS

C. alba (Pilsbry, 1907a) is designated as the type species of *Costatoverruca* n.g. because it is the first species described and illustrated. Aurivillius (1898) presented a brief description of *V. cornuta*, with no illustrations.

The species *C. cornuta* and *C. pacifica* were previously included in *Metaverruca* due to the presence of the myophore (Buckeridge 1994; Young in press), but both species have well developed secondary ridges on the rostrum, the diagnostic feature of *Costatoverruca* n.g.

KEY TO SPECIES :

1a. Rostral area of scutum smooth 2
1b. Rostral area of scutum with longitudinal ridges 3

2a. Scutum with two thin articular ridges; tergum with four articular ridges ..... *C. grimaldi* (Gruvel)
2b. Scutum with three articular ridges, only the axial thin; tergum with three articular ridges ..... *C. xanthia* (Pilsbry)
2c. Scutum and tergum with only a minute axial ridge ..... *C. sinuosa* (Foster *et* Buckeridge)

3a. Tergum with three articular ridges 4
3b. Tergum with four or more articular ridges 7

4a. Well developed myophore present 5
4b. Myophore absent 6

5a. Scutum smaller than tergum; fixed-scutum with a well developed upper triangular area ..... *C. cornuta* (Aurivillius)
5b. Scutum larger than tergum; without upper triangular area ..... *C. xanthia insculpta* (Pilsbry)

6a. Caudal appendage with twenty-three articles, more than three times length of protopod ..... *C. floridana* (Pilsbry)
6b. Caudal appendage with fourteen articles, 1.5 times length of protopod ..... *C. heteropoma* (Pilsbry)

7a. Carina without secondary ridges; caudal appendage twice or less the length of protopod 8
7b. Carina with secondary ridges; caudal appendage more than 2.5 times length of protopod ..... *C. alba* (Pilsbry)

8a. Interlocking ridges of carina and rostrum subequal 9
8b. Interlocking ridges of carina and rostrum conspicuously larger in the upper portion 10

9a. Cirri I and II with anterior about one third length of posterior rami; caudal appendage with twenty-seven articles ..... *C. caribbea* (Pilsbry)
9b. Cirrus I and II with rami of nearly equal length; caudal appendage with twenty-one articles ..... *C. niasiensis* (Nilsson-Cantell)

10a. Articular margins of scutum and tergum, in internal view, sinuous; caudal appendage with fourteen articles, slightly longer than protopod .... *C. calotheca* (Pilsbry)
10b. Articular margins of scutum and tergum, in internal view, essentially straight, with only one tooth above; caudal appendage with 24-26 articles, more than twice length of protopod ..... *C. pacifica* (Buckeridge)

Genus *Rostratoverruca* Broch, 1922

Verruca Section B: *Verruca*, Group of *V. nexa* Pilsbry, 1916: 29.

Verruca Section *Rostratoverruca* Broch, 1922: 298.

Verruca (*Rostratoverruca*) – Broch 1931: 46. – Foster 1978: 68.

Rostratoverruca – Zevina 1987a: 1813. – Buckeridge 1994: 118.

TYPE SPECIES. — *Verruca nexa* Darwin, 1854, by subsequent designation Zevina (1987a: 1813); Recent, West Indies, on a gorgonian.

SPECIES INCLUDED. — *R. nexa* (Darwin, 1854), *R. koehleri* (Gruvel, 1907), *R. conchula minor* (Hoek, 1913), *R. intexta* (Pilsbry, 1912), *R. conchula* (Hoek, 1913) (= *R. intexta*), *R. nexa multiradiata* (Nilsson-Cantell, 1921), *R. kruegeri* (Broch, 1922), *R. kruegeri multisculpta* (Hiro, 1933), *R. murrayi* (Stubbings, 1936) (= *R. intexta*), *R. sewelli* (Stubbings, 1936), and *R. malevichi* Zevina, 1988.

DIAGNOSIS
Form box-like, opercular plates parallel with base; umbo of carina marginal; umbo of rostrum displaced from margin; myophore absent.

Genus *Brochiverruca* Zevina, 1993b

Brochiverruca Zevina, 1993b: 9. – Buckeridge 1994: 105.

TYPE SPECIES. — *Verruca dens* Broch, 1931, by original designation (Zevina 1993b); Recent, Key Islands, 05°46'S - 132°51'E, 348 meters, on a Madreporarian coral.

SPECIES INCLUDED. — *B. dens* (Broch, 1931), *B. margulisae* Zevina, 1993b, and *B. polystriata* Buckeridge, 1994.

DIAGNOSIS
Form box-like, opercular plates parallel with base; umbo of carina and rostrum displaced from margin; myophore absent.

Genus *Metaverruca* Pilsbry, 1916

Verruca Section A: *Metaverruca* Pilsbry, 1916: 21.

Verruca (*Metaverruca*) – Broch 1931: 41. – Foster 1978: 68.

Metaverruca – Zevina 1987a: 1812. – Buckeridge 1994: 108.

TYPE SPECIES. — *Verruca coraliophila* Pilsbry, 1916, by original designation; Recent, between Bahamas and Cape Fear (see Pilsbry 1916: 22, footnote).

SPECIES INCLUDED. — *M. recta* (Aurivillius, 1898), *M. sculpta* (Aurivillius, 1898) (= *M. recta*), *M. aequalis* (Aurivillius, 1898), *M. linearis* (Gruvel, 1900b) (= *M. recta*), *M. trisulcata* (Gruvel, 1900b), *M. striata* (Gruvel, 1900b) (= *M. trisulcata*), *M. magna* (Gruvel, 1901) (= *M. recta*), *M. halotheca* (Pilsbry, 1907b) (= *M. recta*), *M. capsula* (Hoek, 1913) (= *M. recta*), *M. coraliophila* (Pilsbry, 1916) (= *M. recta*), *M. corrugata* (Broch, 1931), *M. macuni* (Stubbings, 1936), *M. tarasovi* (Zevina, 1971), *M. lepista* (Zevina, 1987b), *M. seriola* (Zevina, 1987b), *M. pallida* Zevina, 1990, *M. defiyeae* Buckeridge, 1994, *M. norfolkensis* Buckeridge, 1994, *M. plicata* Buckeridge, 1994, and *M. reunioni* Foster *et* Buckeridge, 1995b.

DIAGNOSIS

Form box-like, opercular plates parallel with base; umbo of carina and rostrum marginal, without secondary ridge; myophore well developed, basal margin of plates enlarged, sometimes fused.

KEY TO SPECIES :

1a. Shell with conspicuous radial ridges 2
1b. Shell without radial ridges 4

2a. Numerous fine radial ridges, with eleven or more ridges on each plate 3
2b. Few large radial ridges, with ten or fewer ridges on each plate ..... *M. trisulcata* (Gruvel)

3a. Caudal appendage with seven articles, shorter than protopod ..... *M. corrugata* (Broch)
3b. Caudal appendage with twenty-seven articles, more than twice length of protopod ..... *M. plicata* Buckeridge

4a. Opercular valves with or without a barely defined articular ridge 5
4b. Opercular valves with at least one articular ridge conspicuous 6

5a. Opercular plates small in relation to the shell, carina and rostrum with a straight articulation ..... *M. pallida* Zevina
5b. Opercular plates large in relation to the shell, carina and rostrum with a single large articular ridge ..... *M. reunioni* Foster *et* Buckeridge

6a. Opercular plates nearly parallel with the base of the wall 7
6b. Opercular plates forming a distinct angle with the base of the wall 12

7a. Tergum with three articular ridges 8
7b. Tergum with four articular ridges 9

8a. Shell smooth; carina and rostrum apical margins straight ..... *M. recta* (Aurivillius)
8b. Shell with grooves between the opercular valves ridges; carina and rostrum margins concave ..... *M. aequalis* (Aurivillius)

9a. Scutum with three articular ridges 10
9b. Scutum with four articular ridges 11

10a. Rostrum and carina articulation with three ridges; radii-process of fixed scutum small ..... *M. macani* (Stubbings)
10b. Rostrum and carina articulation with four ridges; radii-process of fixed scutum large ..... *M. tarasovi* (Zevina)

11a. Rostrum and carina articulation with as many as three ridges; mandible with five teeth ..... *M. defayeae* Buckeridge

11b. Rostrum and carina articulation with as many as five ridges; mandible with three teeth ..... *M. norfolkensis* Buckeridge

12a. Scutum with a beaked apex; caudal appendage with six articles ..... *M. lepista* (Zevina)

12b. Scutum with an obtuse apex; caudal appendage with eleven articles ..... *M. seriola* (Zevina)

Genus *Verruca* Schumacher, 1817

Verruca Schumacher, 1817: 35. – Darwin 1854: 496 (in part).

Verruca Section B: *Verruca*, Group of *V. strömia* Pilsbry, 1916: 23.

Verruca (*Eu-Verruca*) Broch, 1931: 45.

Verruca (*Verruca*) – Foster 1978: 68 (in part). – Zevina 1987a: 1812 (in part). – Buckeridge 1994: 90 (in part).

TYPE SPECIES. — *Lepas stroemia* Müller, 1776, by monotypy; Recent, no locality (Schumacher, 1817: 91).

SPECIES INCLUDED. — *V. stroemia* (Müller, 1776); *V. spengleri* Darwin, 1854; *V. laevigata* (Sowerby, 1827), and *V. cookei* Pilsbry, 1927.

DIAGNOSIS

Form depressed, opercular plates parallel with base, proportionately small; umbo of carina and rostrum marginal, without secondary ridge; myophore well developed, projecting parallel to base.

KEY TO SPECIES :

1a. Movable scutum with adductor ridge 2

1b. Movable scutum without adductor ridge 3

2a. Caudal appendage with nine articles, one half length of cirrus VI ..... *V. spengleri* Darwin

2b. Caudal appendage with eleven articles, two third length of cirrus VI ..... *V. cookei* Pilsbry

3a. Width of scutum less than its length, the second articular ridge narrower than the first articular ridge ..... *V. stroemia* Müller

3b. Width of scutum more than its length, the second articular ridge broader than the first articular ridge ..... *V. laevigata* Sowerby

THE AZORES FAUNA

Including the species reported herein and those of previous studies on the Azores Region (Hoek 1883; Aurivillius 1898; Gruvel 1900a, b, 1902a, 1920; Pilsbry 1916; Zevina 1976; Baker 1967; Newman & Ross 1977; Young in press) there are a total of sixty-one taxa in this region. Twelve of these taxa are considered synonymous, *viz*: *S. edwardsi* and *S. alboranense* (= *Neoscalpellum dehile*), *S. erectum* and *S. velutinum* (= *Arcoscalpellum michelottianum*), *S. striatum* (= *Amigdoscapellum rigidum*), *S. molle* (= *Trianguloscalpellum regium*), *S. gigas* Gruvel, 1902 (= *Trianguloscalpellum ovale*, not *S. gigas* Hoek), *V. sculpta* and *V. linearis* (= *Metaverruca recta*),

S. vitreum Zevina, 1976 (= *S. rigidum*); *T. squamosa elegans* Baker, 1967, and *Tesseropora atlantica* Newman *et* Ross, 1977 (part, specimens from Azores) (= *Tesseropora arnoldi* n.sp.).

Within the remaining fifty-one species, four records are probably misidentifications by Gruvel (1905, 1920): *V. stroemia*, *B. amphitrite*, *B. spongicola* and *B. crenatus*: *Verruca stroemia* and *B. crenatus* are northern shallow water species and were only recorded once from the Azores Region. *Balanus amphitrite* and *B. spongicola* have not been recorded again since Gruvel (1905, 1920).

The species of *Poecilasma* are poorly defined and, therefore, there is the possibility that the three species recorded are synonymous. Two species, *P. aurantia* and *P. crassum*, are definitely known in this region. The list of species is, therefore, reduced to forty-five, which includes twenty-eight lepadomorphs, eleven verrucomorphs and six balanomorphs (Appendix 2).

The endemism of the Azores appears to be high, fourteen species (31%). Three species occur in the Azores and Madeira Islands, and Great Meteor Bank, which gives an endemism of this larger area to 38%. Furthemore, four species occur at the Iberian Basin, with records also off the Iberian Peninsula and Morocco coast, which expands the endemism ratio to 47%. The remaining species usually have a Northeastern Atlantic distribution or greater (Appendix 2). The Azores fauna does not share any species with Tropical Africa.

Conversely, it is interesting to note the low species richness in shallow waters (less than 200 m). *Tesseropora arnoldi* and *M. azoricus* are endemic to the Azores, *V. spengleri* occurs also in Madeira. *Chthamalus stellatus* is recorded along the European and North African coasts and *B. trigonus*, which has a world-wide distribution, may have been recently introduced to the Atlantic (Zullo 1992).

In the Northeastern Atlantic the deep sea species are reasonably well sampled along the Azores-Madeira-Great Meteor area (Iberian and Canary Basins) and the North Sea (Norwegian Basin) but they are still poorly sampled in the West European Basin.

The deep sea faunas of the Norwegian Basin and of the Iberian/Canarian Basins do not share any common species, except for *Scalpellum scalpellum*, a species with a wide depth range of 10-540 m, but usually between 30 and 200 m. It is recorded from shallow waters of the Iberian Peninsula and scattered localities along the North African coast (Nilsson-Cantell 1978).

Acknowledgements

I wish to acknowledge Jacques Forest for allowing me to study this collection and also for information about the Biaçores Expedition; William A. Newman and Arnold Ross, for numerous discussions during this study and their comments on the manuscript, which significantly improved this paper; John S. Buckeridge, Diana Jones and Annemarie Ohler for providing useful comments on the manuscript; Florence Kerdoncuff for helpful assistance with the manuscript revision. This study was supported by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and additional financial support from Fundação Universitária José Bonifácio (FUJB).

REFERENCES

Anderson D. T. 1980. — Cirral activity and feeding in the Verrucomorph barnacles *Verruca recta* Aurivillius and *V. stroemia* (O. F. Müller) (Cirripedia). *Journal of the Marine Biological Association of the United Kingdom* 60: 349-366.

Aurivillius C. W. S. 1894. — Studien über Cirripeden. *Kungliga Svenska Vetenskapsakademiens Handlingar* 26 (7): 1-107.

Aurivillius C. W. S. 1898. — Cirrhipèdes nouveaux provenant des Campagnes Scientifiques de S. A. S. le Prince de Monaco. *Bulletin de la Société Zoologique de France* 23: 189-198.

Bacon P. R. 1976. — The Cirripedia of Trinidad. *Studies on the Fauna of Curaçao and Other Caribbean Islands* 50: 1-55.

Baker I. H. 1967. — Cirripedia. *Chelsea College Azores Expedition, July-October 1965*: 46-47.

Bayer F. M., Voss G. L. & Robins C. R. 1970. — Cirripedia: A43. *in*: Report on the marine fauna and benthic shelf-slope communities of the Isthmian Region. *Bioenvironmental and radiological-safety feasibility studies Atlantic-Pacific interoceanic canal*, Battelle Memorial Institute, Columbus.

Belloc G. 1959. — Catalogue des types de Cirrhipèdes du Musée océanographique de Monaco. *Bulletin de l'Institut Océanographique*, Monaco (1157) : 1-7.

Broch H. 1922. — Papers from Dr. Th. Mortensen's Pacific Expedition 1914-1916. Studies on Pacific Cirripeds. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening* 73: 215-358.

— 1931. — Papers from Dr. Th. Mortensen's Pacific Expedition. 1914-1916. Indomalayan Cirripedia. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening* 91: 1-146.

— 1953. — Cirripedia Thoracica. *Danish Ingolf-Expedition* 3 (14): 1-16.

Buckeridge J. S. 1975. — The significance of Cirripedes to the paleoecology of Moturapu Island. *TANE, Journal of Auckland University Field Club* 21: 121-129.

— 1983. — Fossil barnacles (Cirripedia: Thoracica) of New Zealand and Australia. Paleont. *Bulletin of New Zealand Geological Survey* 50: 1-151, 13 pls.

— 1994. — Cirripedia Thoracica: Verrucomorpha of New Caledonia, Indonesia, Wallis and Futuna Islands, *in* Crosnier A. (ed.), Résultats des Campagnes MUSORSTOM, 12, *Mémoires de Muséum national d'Histoire naturelle* 161 : 87-125.

— 1997. — Cirripedia Thoracica: New ranges and species of Verrucomorpha from the Indian and Southwest Pacific Oceans, *in* Crosnier A. (ed.), Résultats des Campagnes MUSORSTOM, 18, *Mémoires de Muséum national d'Histoire naturelle* 176 : 125-149.

Calman W. T. 1918. — On barnacles of the genus *Scalpellum* from deep-sea telegraph-cables. *Annals and Magazine of Natural History*, Series 9, 1: 96-124.

— 1919. — On barnacles of the genus *Megalasma* from deep-sea telegraph-cables. *Annals and Magazine of Natural History*, Series 9, 4: 361-374.

Darwin C. 1852. — *A Monograph on the Subclass Cirripedia, with figures of all the species. The Lepadidae; or pedunculate cirripedes.* Ray Society, London, 400 p.

— 1854. — *A Monograph on the Subclass Cirripedia, with figures of all the species. The Balanidae, the Verrucidae, etc.* Ray Society, London, 684 p.

Edwards A. & Lubbock. R. 1983a. — The ecology of Saint Paul's Rocks (equatorial Atlantic). *Journal of Zoology* 200: 51-69.

Edwards A. & Lubbock R. 1983b. — Marine zoogeography of Saint Paul's Rocks. *Journal of Biogeography* 10: 65-72.

Fischer P. 1871. — Crustacés Podophthalmaires et Cirrhipèdes du Département de La Gironde et des côtes du Sud-Ouest de la France. *Actes de la Société Linnéenne de Bordeaux*, séries 3, 28 : 405-432.

Foster B. A. 1978. — The marine fauna of New Zealand: Barnacles (Cirripedia: Thoracica). *Memoirs. New Zealand Oceanographic Institute* 69: 1-160.

— 1981. — Cirripedes from the ocean ridges north of New Zealand. *New Zealand Journal of Zoology* 8: 349-367.

Foster B. A. & Buckeridge J. S. 1995a. — Barnacles (Cirripedia: Thoracica) of seas off the Straits of Gibraltar. *Bulletin du Muséum National d'Histoire Naturelle*, Paris, série 4, 17: 163-191.

— 1995b. — Barnacles (Cirripedia: Thoracica) of seas off Réunion Island and East Indies. *Bulletin du Muséum national d'Histoire naturelle*, Paris, série 4, 16 : 345-382.

Gordon J. A. 1970. — An annotated checklist of Hawaiian barnacles (Class Crustacea; Subclass Cirripedia) with notes on their nomenclature, habitats and Hawaiian localities. *Hawaii Institute of Marine Biology, Technical Reports* 19: 1-130.

Gruvel A. 1900a. — Sur quelques espèces nouvelles du genre *Scalpellum* provenant des dragages du "Talisman". *Bulletin du Muséum d'Histoire naturelle*, Paris 6 : 189-194.

— 1900b. — Sur les espèces nouvelles du genre *Verruca* provenants du "Talisman", *Bulletin du Muséum d'Histoire naturelle*, Paris 6 : 242-244.

— 1901. — Diagnoses de quelques espèces nouvelles de Cirrhipèdes. *Bulletin du Muséum d'Histoire Naturelle* Paris 7 : 256-263.

— 1902a. — Cirrhipèdes; 1-178, pls 1-7, *in Expéditions Scientifiques du "Travailleur" et du "Talisman", pendant les années 1880, 1881, 1882, 1883*. Masson, Paris, 178 p.

— 1902b. — Sur quelques espèces nouvelles de la collection du British Museum. *Transactions of the Linnean Society of London, Zoology*, Series 2, 8: 277-294, pl. 24.

— 1902c. — Catalogue des Cirrhipèdes appartenant à la collection du Muséum. *Bulletin du Muséum d'Histoire Naturelle*, Marseille 8 : 522-526.

— 1905. — *Monographie des Cirrhipèdes ou Thecostracés*. Masson et Cie Éditeurs, Paris, 472 p.

— 1907. — Cirrhipèdes Operculés de l'Indian Museum of Calcutta. *Memoirs of the Asiatic Society of Bengal* 2 (1): 1-10.

— 1911. — Sur deux espèces nouvelles de Cirrhipèdes appartenant à la collection du Muséum. *Bulletin du Muséum d'Histoire naturelle*, Paris 17 (5) : 290-291.

— 1912a. — Note préliminaire sur les Cirrhipèdes recueillis pendant les campagnes de S. A. S. le Prince de Monaco. *Bulletin de l'Institut Océanographique* (241) : 1-7.

— 1912b. — Mission Gruvel sur la côte occidentale d'Afrique (1909-1910) et collection du Muséum d'Histoire naturelle. Les Cirrhipèdes. *Bulletin du Muséum d'Histoire naturelle*, Paris 18 (6) : 344-350.

— 1920. — Cirrhipèdes provenant des campagnes scientifiques de S. A. S. le Prince de Monaco. *Résultats des Campagnes Scientifiques accomplies sur son yacht Albert Ier, Prince Souverain de Monaco* 53 : 1-89, pls 1-7.

Henry D. P. & McLaughlin P. A. 1986. — The Recent species of *Megabalanus* (Cirripedia: Balanomorpha) with special emphasis on *Balanus tintinnabulum* (Linnaeus) *sensu lato*. *Zoologische Verhandelingen* (235): 1-69.

Hoek P. P. C. 1883. — Report on the Cirripedia collected by H. M. S. *Challenger* during the years 1873-76. *Report on the Scientific Results of the Voyage of H. M. S.* Challenger *During the Years 1873-1876. Zoology*, part 25, 8: 1-169.

— 1884. — Report on the Cirripedia collected by H. M. S. *Challenger* during the years 1873-76. Anatomical Part. *Report on the Scientific Results of the Voyage of H. M. S.* Challenger *During the Years 1873-1876. Zoology*, part 28, 10: 1-47, pls 1-6.

— 1907a. — The Cirripedia of the *Siboga* Expedition. A. Cirripedia Pedunculata. *Siboga Expeditie* 31a: 1-127, pls 1-10.

— 1907b. — Cirripedia. *Résultats du Voyage "S.Y. Belgica", Rapports Scientifiques*, Zoologie: 3-9.

— 1913. — The Cirripedia of the *Siboga* Expedition. B. Cirripedia Sessilia. *Siboga Expeditie* 31b: 129-275, pl. 11-27.

— 1914. — Cirripedia. *"Michael Sars" North Atlantic Deep-sea Expedition 1910*, Zoology 3: 1-6.

Kolosváry, G. 1943. — Cirripedia Thoracica in der sammlung des Ungarischen National-Museums. *Annales Historico Naturales Musei Nationalis Hungarici* 36: 67-120.

— 1947. — Die Balaniden der Adria. *Annales Historico Naturales Musei Nationalis Hungarici* 39 (1): 1-88.

— 1951. — Les Balanides de la Méditerranée. *Acta Biologica Academiae Scientiarum Hungaricae* 2 (4): 411-413.

Krüger P. 1940. — Cirripedia. *in*: Bronns H. G. (ed.). *Klassen und Ordnungen des Tierreichs*, Leipzig, 5 (3): 1-391.

Lahille F. 1910. — Los Cirripedios en la Argentina. *Revista del Jardin Zoologico Buenos Aires*, serie 2, 6: 69-89.

Leta A. C. & Young P. S. 1995 [1996]. — First record from the family Oxynaspididae (Crustacea, Cirripedia) from the Southwestern Atlantic. *Nauplius* 3: 23-31.

Linnaeus C. 1758. — *Systema naturae*. Reformata 1: 1-824. Holmiae, Editio Decima.

— 1767. — *Systema naturae*. Reformata 2: 533-1327. Holmiae, Editio Duodecima.

Müller O. F. 1776. — *Zoologiae Danicae Prodomus, seu Animalium Daniae et Norvegiae, indigenarum charactheres, nomina, et synonyma imprimis popularium*. Havniae, i-xxvii, 1-282.

Newman W. A. & Ross A. 1971. — Antarctic Cirripedia. *Antarctic Research Series* 14: 1-257.

— 1976. — Revision of the balanomorph barnacles; including a catalog of the species. *Memoirs of the San Diego Society of Natural History* 9: 1-108.

— 1977. — A living *Tesseropora* (Cirripedia: Balanomorpha) from Bermuda and the Azores: First records from the Atlantic since the Oligocene. *Transactions of the San Diego Society for Natural History* 18 (12): 207-216.

Nilsson-Cantell C. A. 1921. — Cirripeden-Studien. Zur kenntnis der Biologie, Anatomie und Systematik dieser Gruppe. *Zoologiska Bidrag från Uppsala* 7: 75-395, 3 pl.

— 1927. — Some barnacles in the British Museum (Nat. Hist.). *Proceedings of the Zoological Society of London*: 743-790.

— 1928. — Studies on cirripedes in the British Museum (Nat. Hist.). *Annals and Magazine of Natural History*, Series 10, 2 (7): 1-39.

— 1929. — Cirripedien des genus *Verruca* der Deutschen Tiefsee-Expedition auf dem Dampfer "Valdivia" 1898-1899. *Zoologische Jahrbücher* 58: 459-480.

— 1931. — Cirripeds from the Indian Ocean and Malay Archipelago in the British Museum (Nat. Hist.), London. *Arkiv för Zoologi* 23 A (18): 1-12.

— 1934. — Cirripeds from the Malay Archipelago in the Zoological Museum of Amsterdam. *Zoologische Mededeelingen* 17: 31-63.

— 1938. — Cirripedes from the Indian Ocean in the collection of the Indian Museum, Calcutta. *Memoirs of the Indian Museum* 13 (1): 1-81.

— 1955. — Cirripedia. *Reports of the Swedish Deep-Sea Expedition, Zoology* 2(17): 215-220.

— 1978. — Cirripedia Thoracica and Acrothoracica. *Marine Invertebrates of Scandinavia* (5): 1-135.

Pilsbry H. A. 1907a. — The barnacles (Cirripedia) contained in the collections of the U.S. National Museum. *Bulletin of the United States National Museum* 60: 1-122.

— 1907b. — Hawaiian Cirripedia. *Bulletin of the Bureau of Fisheries* 26: 181-204, pls 6-11.

— 1916. — The sessile barnacles (Cirripedia) contained in the collections of the U. S. National Museum; including a monograph of the American species. *Bulletin of the United States National Museum* 93: 1-366.

Poli G. S. 1791. — *Testacea utriusque Siciliae, eorumque historia et anatome, tabulis aeneis illustrata*. Parmae, 2 volums and atlas.

Relini G. 1969. — La distribuzione dei Cirripedi Toracici nei mare Italiana. *Archivio Botanico e Biogeografico Italiano*, serie 4, 45 (4): 168-186.

Ren X. 1984. — Studiens on Chinese Cirripedia (Crustacea). IV. Family Verrucidae. *Studia Marina Sinica* 23: 165-179, pls 1-2 [in Chinese].

— 1989. — On a collection of Cirripedia Thoracica from Madagascar and adjacent waters. *Bulletin du Muséum national d'Histoire naturelle*, serie 4, A 11 (2) : 431-468.

Rosell N. C. 1981. — Crustacea: Cirripedia. Résultats des Campagnes MUSORSTOM. 1 (12), *Mémoires de Muséum national d'Histoire naturelle* 91 : 277-307.

— 1989. — Thoracic Cirripeds from the MUSORSTORM 2 Expedition, *in* Forest J. (ed.), Résultats des Campagnes MUSORSTORM, 5, *Mémoires du Muséum national d'Histoire naturelle* (A) 144 : 9-35.
— 1991. — Crustacea Cirripedia Thoracica: Musorstom. Phillipines collection, *in* Résultats des Campagnes MUSORSTOM 9 (1), *Mémoires du Muséum national d'Histoire naturelle* (A) 152 : 9-61.
Ruggieri, G. 1953. — Età e faune di um terrazzomarino sulla costa ionica della Calabria. *Giornale di Geologia*, serie 2, 17: 95-113.
Ruggieri, G. 1977. — Le *Verruca* del Pleistocene Neritico della Sicilia. *Il Naturalista Siciliano, serie IV*, 1(1-4) 67-74.
Schumacher C. F. 1817. — *Essai d'un nouveau système des habitations des vers Testacés*. Copenhagen, 287 p.
Seguenza G. 1876. — Ricerche paleontologiche intorno ai Cirripedi Terziarii della Provincia di Messina. Parte II. Terza famiglia Lepadidi Darwin. *Atti Dell'Accademia Pontoniana* 10: 369-481, pls 6-10.
Southward A. J. 1976. — On the taxonomic status and distribution of *Chthamalus stellatus* (Cirripedia) in the North-east Atlantic region: with a key to the common intertidal barnacles of Britain. *Journal of the Marine Biological Association of the United Kingdom* 56: 1007-1028.
Southward A. J. & Southward E. C. 1958. — On the occurrence and behaviour of two little-known barnacles, *Hexelasma hirsutum* and *Verruca recta*, from the continental slope. *Journal of the Marine Biological Association of the United Kingdom* 37: 633-647.
Spengler L. 1792. — Beskrivelse over tvende nye arter af *Lepas*. *Naturhist-Selskabet Kjobenhavn Skrifter* 2 (11): 103-110, pl. 10.
Stubbings H. G. 1936. — Cirripedia. *John Murray Expedition, Scientific Reports, Zoology* 4 (1): 1-70.
— 1964. — Cirripedia. Campagnes de la "Calypso": îles du Cap Vert. *Annales de l'Institut Océanographique* 41 : 103-112.
— 1967. — The cirriped fauna of tropical West Africa. *Bulletin of the British Museum (Natural History)*, Zoology 15 (6): 229-319.
Tarasov N. I. & Zevina G. B. 1957. — Cirripedia. *Fauna SSSR*, n.s. 69: 1-268 [in Russian].
Thomson C. W. 1873. — Notes from the "Challenger". *Nature* 8: 347-349.
— 1877. — *The Voyage of the "Challenger". The Atlantic*, 2. Macmillan and Co, London, 396 p.
Totton A. K. 1940. — New species of the Cirripede genus *Oxynaspis*, commensal with Antipatharia. *Annals and Magazine of Natural History*, Series 11, 36: 465-486.
Utinomi H. 1965. — A giant Antarctic barnacle *Hexelasma antarcticum* Borradaile (Cirripedia, Thoracica). *Japanese Antarctic Research Expedition 1956-1962, Scientific Reports*, series E (25): 1-16.
Weisbord N. E. 1979. — Lepadomorph and Verrucomorph barnacles (Cirripedia) of Florida and adjacent waters, with an addendum on the Rhizocephala. *Bulletin of American Paleontology* 76 (306): 1-156.
Weltner W. 1897. — Verzeichnis der bisher beschriebenen recenten Cirripedienarten. Mit Angabe der im berliner Museum vorhandenen Species und ihrer Fundorte. *Archiv für Naturgeschichte* 1 (3): 227-280.
— 1922. — Cirripedia der Deutschen Tiefsee-Expedition. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Exped. Dampfer "Valdivia" 1898-1899* (2): 1-112, pls II-IV.
Young P. in press. — The Cirripedia (Crustacea) collected by the Fisheries Steamer "Meteor" in the Eastern Atlantic. *Senckenbergiana Biologica*
Zevina G. B. 1963. — Barnacles inhabiting the Black Sea. *Trudy Instituta Okeanologica* 70: 72-75 [in Russian].
— 1969. — Cirripedia Thoracica: 66-68, *in* Kort V. G. (ed.), *The biology of the Pacific Ocean, Deep-sea botton fauna*. 2 (1), Institut Okeanologia Akademy Nauka SSSR, Moscow [in Russian].
— 1976. — Abyssal species of barnacles (Cirripedia, Thoracica) of the North Atlantic. *Zoologicheskii Zhurnal* 55(8): 1149-1156 [in Russian].
— 1978. — A new system of the family Scalpellidae Pilsbry (Cirripedia, Thoracica). 2. Subfamilies Arcoscalpellinae and Meroscalpellinae. *Zoologicheskii Zhurnal* 9: 1343-1352 [in Russian].
— 1981. — Barnacles of the suborder Lepadomorpha of the world ocean. I. Family Scalpellidae. *Fauna USSR*, Zoologicheskii Institut Akademy Nauka SSSR, 127: 1-406 [in Russian].
— 1982. — Barnacles of the suborder Lepadomorpha of the world ocean. II. *Fauna USSR*, Zoologicheskii Institut Akademy Nauka SSSR,133: 1-222 [in Russian].
— 1987a. — Deep-sea Verrucomorpha (Cirripedia, Thoracica) of the Pacific. 1. The North Pacific. *Zoologicheskii Zhurnal* 66 (12): 1812-1821 [in Russian].
— 1987b. — Abyssal Cirripedia Verrucomorpha (Thoracica) of the Atlantic and Indian Ocean. *Zoologicheskii Zhurnal* 66 (9): 1304-1313 [in Russian].
— 1988. — Deep-sea Verrucomorpha (Cirripedia, Thoracica) of the Pacific. 2. The South Pacific. *Zoologicheskii Zhurnal* 67 (1): 31-40 [in Russian].
Zullo V. A. 1968. — Catalog of the Cirripedia named by Henry A. Pilsbry. *Proceedings of the Academy of Natural Sciences of Philadelphia* 120 (5): 209-235.
— 1992. — *Balanus trigonus* Darwin (Cirripedia, Balanidae) in the Atlantic Basin: An introduced species? *Bulletin of Marine Science* 50 (1): 66-74.

Submitted on 29 July 1997;
accepted on 15 December 1997.

APPENDIX 1

List of species per station. The numbers preceded by the letters L and P concern respectively intertidal hand collecting and scuba diving. The numbers without a letter refer to the stations from the *Jean Charcot*.

Station	Date	Location	Species
L5	2.X.1971	Santa Maria Island (South), Praia	*Chthamalus stellatus.*
L7	5.X.1971	Praia de Santos, "E. Roque", sur tube rejeté	*Lepas anatifera*, *L. pectinata.*
L8	8.X.1971	Terceira Island, West of Monte Brazil	*Verruca spengleri*, *Balanus trigonus.*
L9	11.X.1971	Faial Island, Horta	*Tesseropora arnoldi* n.sp., *Megabalanus azoricus.*
L11	11.X.1971	Faial Island, Caldeira do Inferno (South)	*Chthamalus stellatus*, *Tesseropora arnoldi* n.sp.
P3	1.X.1971	Santa Maria Island, Ponta Malbusca, 12-25 m	*Verruca spengleri*, *Balanus trigonus.*
P4	2.X.1971	Santa Maria Island, Ponta do Casteleto, 12-15 m	*Verruca spengleri*, *Balanus trigonus.*
P6	7.X.1971	J. do Castro Bank, 28°13'N - 26°36'W, 25-35 m	*Lepas anatifera*, *Balanus trigonus.*
P7	8.X.1971	Terceira Island, Ponta de S. Diego (West of Monte Brazil), 5-40 m	*Verruca spengleri*, *Balanus trigonus*, *Megabalanus azoricus.*
P8	10.X.1971	Faial Island, Horta (Port), 0-18 m	*Verruca spengleri*, *Balanus trigonus.*
P9	11.X.1971	Faial Island, Monte da Guia (East of Caldeira do Inferno), 5-15 m	*Verruca spengleri*, *Tesseropora arnoldi* n.sp., *Balanus trigonus.*
P12	13.X.1971	Faial Island, Ponta Furada, 0-7 m	*Verruca spengleri.*
P13	13.X.1971	Faial Island, Horta, 3-18 m	*Verruca spengleri.*
P14	15.X.1971	S. Jorge Island, West of Cabo Monteiro, 40 m	*Balanus trigonus.*
P15	15.X.1971	S. Jorge Island, West of Cabo Monteiro, 27 m	*Balanus trigonus.*
P17	16.X.1971	Graciosa Island, Calle de Folga, 2-8 m	*Verruca spengleri*, *Balanus trigonus.*
P19	18.X.1971	Faial Island, Monte da Guia, 20 m	*Verruca spengleri.*
P23	22.X.1971	Flores Island, North of Santa Cruz, 15 m	*Verruca spengleri.*
P24	22.X.1971	Flores Island, Ilheu da Muda, 22-30 m	*Verruca spengleri.*
P27	27.X.1971	São Miguel Island, Caloura (South), 0-10 m	*Verruca spengleri.*
P29	28.X.1971	São Miguel Island, Ponta da Galera (South), 7-18 m	*Verruca spengleri*, *Tesseropora arnoldi* n.sp., *Balanus trigonus.*
P30	29.X.1971	São Miguel Island, Caloura (S.), 0-6 m	*Verruca spengleri.*
P33	30.X.1971	São Miguel Island, Santa Clara, Ponta Delgada (South), 7-15 m	*Verruca spengleri.*
P34	31.X.1971	São Miguel Island, Ponta de Galera (Southeast), 10-12 m	*Balanus trigonus.*
P38	2.XI.1971	São Miguel Island, Ilheu dos Mosteiros (W.), 2-37 m	*Megabalanus azoricus.*
P41	4.XI.1971	São Miguel Island, Morro das Capelas (N.), 15-20 m	*Balanus trigonus*, *Megabalanus azoricus.*
P44	8.XI.1971	Formigas Island, 35-45 m	*Oxynaspis celata.*
1	7.X.1971	38°13'N - 26°36'W, 40-50 m	*Verruca spengleri*, *Balanus trigonus.*
4	7.X.1971	38°11,5'N - 28°38,5'W, 1200-1080 m	*Metaverruca recta.*
6	7.X.1971	38°14'N - 26°38,5'W, 570 m	*Altiverruca gibbosa*, *Bathylasma hirsutum.*

Station	Date	Location	Species
10	8.X.1971	38°39'N - 27°14,5'W, 28-33 m	*Balanus trigonus.*
11	8.X.1971	38°30'N - 27°14,5'W, 105-76 m	*Balanus trigonus.*
14	4.XII.1968	47°56,3'N - 07°32,8'W, 214-235 m	*Verruca stroemia.*
16	8.X.1971	38°39'N - 27°21'W, 990-880 m	*Metaverruca recta.*
46	12.X.1971	37°34'N - 28°54'W, 784 m	*Bathylasma hirsutum.*
60	14.X.1971	38°33,5'N - 28°33'W, 66-70 m	*Balanus trigonus.*
61	14.X.1971	38°34'N - 28°32,5'W, 77 m	*Verruca spengleri.*
62	14.X.1971	38°39,5'N - 28°37,5'W, 800-736 m	*Poecilasma aurantia,* *Metaverruca recta,* *Costatoverruca cornuta.*
66	15.X.1971	38°34,5'N - 28°19,5'W, 1260-1225 m	*Metaverruca recta,* *Arcoscalpellum tritonis.*
73	15.X.1971	38°30'N - 27°51,5'W, 245 m	*Heteralepas microstoma.*
89	17.X.1971	39°04,5'N - 28°07,5'W, 358-406 m	*Oxynaspis patens.*
105	20.X.1971	39°35'N - 31°23'W, 1550 m	*Arcoscalpellum michelottianum.*
120	22.X.1971	39°03,5'N - 32°43,5'W, 2100 m	*Lepas pectinata.*
129	23.X.1971	38°58'N - 33°26,5'W, 3056-3000 m	*Trianguloscalpellum regium,* *Teloscalpellum luteum.*
131	24.X.1971	39°04,5'N - 32°43,5'W, 2120 m	*Lepas pectinata,* *Neoscalpellum debile.*
135	25.X.1971	39°24,5'N - 31°05,5'W, 860-760 m	*Metaverruca recta.*
139	26.X.1971	38°36,5'N - 28°17,5'W, 1260 m	*Metaverruca recta.*
142	30.X.1971	37°41,5'N - 25°31'W, 103 m	*Verruca spengleri.*
143	30.X.1971	37°42'N - 25°32'W, 69-61 m	*Verruca spengleri,* *Balanus trigonus.*
148	30.X.1971	37°34,5'N - 25°34,5'W, 847-870 m	*Poecilasma aurantia,* *Metaverruca recta,* *Costatoverruca cornuta.*
150	30.X.1971	37°37'N - 25°35'W, 600-550 m	*Metaverruca recta,* *Costatoverruca cornuta.*
151	30.X.1971	37°37,5'N - 25°39,5'W, 788-780 m	*Metaverruca recta,* *Costatoverruca cornuta.*
157	31.X.1971	37°33,5'N - 25°43,5'W, 826-787 m	*Poecilasma aurantia,* *Costatoverruca cornuta.*
159	31.X.1971	37°26'N - 25°51'W, 600-525 m	*Poecilasma aurantia,* *Metaverruca recta,* *Altiverruca gibbosa,* *Costatoverruca cornuta.*
161	31.X.1971	37°39,5'N - 25°50,5'W, 590 m	*Metaverruca recta,* *Costatoverruca cornuta*
168	1.XI.1971	37°48,5'N - 25°54'W, 800-665 m	*Metaverruca recta.*
171	1.XI.1971	37°58,5'N - 26°07'W, 3215 m	*Metaverruca aequalis.*
174	2.XI.1971	38°06'N - 26°15'W, 3094-3038 m	*Amigdoscalpellum rigidum,* *Metaverruca aequalis.*
176	2.XI.1971	38°00,5'N - 26°21,5'W, 2720-2440 m	*Amigdoscalpellum rigidum.*
179	3.XI.1971	38°05,5'N - 25°46'W, 1665-1590 m	*Smilium acutum.*
180	3.XI.1971	37°57,5'N - 25°33'W, 1235-1069 m	*Glyptelasma hamatum,* *Poecilasma aurantia,* *Arcoscalpellum michelottianum,* *Altiverruca obliqua,* *A. gibbosa,* *Metaverruca aequalis,* *M. recta,* *Bathylasma hirsutum,* *Hexelasma americanum.*
181	3.XI.1971	37°53'N - 25°35,5'W, 620-450 m	*Metaverruca recta,* *Costatoverruca cornuta.*
186	4.XI.1971	37°51,5'N - 25°40'W, 455-370 m	*Megabalanus azoricus.*
196	5.XI.1971	37°50'N - 24°55,5'W, 1191-1146 m	*Metaverruca recta.*

Station	Date	Location	Species
			Arcoscalpellum michelottianum, *Altiverruca gibbosa*, *Metaverruca aequalis*.
197	5.XI.1971	37°49,5'N - 25°01,5'W, 815 m	*Metaverruca recta*, *M. trisulcata*.
199	5.XI.1971	37°54,5'N - 25°08'W, 800-770 m	*Poecilasma aurantia*, *Altiverruca gibbosa*, *Metaverruca recta*, *Costatoverruca cornuta*.
202	6.XI.1971	37°26,5'N - 25°00'W, 2900 m	*Glyptelasma hamatum*, *Neoscalpellum debile*, *Catherinum recurvitergum*, *Amigdoscalpellum rigidum*, *Trianguloscalpellum regium*.
206	7.XI.1971	37°21'N - 25°28,5'W, 2047 m	*Amigdoscalpellum rigidum*.
216	8.XI.1971	37°16,5'N - 24°46,5'W, 80-90 m	*Verruca spengleri*, *Tesseropora arnoldi* n.sp., *Megabalanus azoricus*.
218	8.XI.1971	36°54'N - 25°08'W, 772-800 m	*Metaverruca recta*.
224	9.XI.1971	37°03'N - 25°05'W, 60 m	*Verruca spengleri*.
227	10.XI.1971	37°10'N - 25°19,5'W, 2160-2180 m	*Glyptelasma hamatum*, *Amigdoscalpellum rigidum*.
231	10.XI.1971	36°55'N - 25°10'W, 440-380 m	*Metaverruca recta*.
237	11.XI.1971	37°21,5'N - 25°45,5'W, 759 m	*Poecilasma aurantia*, *Metaverruca recta*, *Costatoverruca cornuta*.
239	11.XI.1971	37°28,5'N - 25°45'W, 646-628 m	*Metaverruca recta*, *Costatoverruca cornuta*.
240	12.XI.1971	37°35'N - 25°32,5'W, 825-810 m	*Metaverruca recta*, *M. trisulcata*, *Bathylasma hirsutum*.
245	14.XI.1971	40°57'N - 22°16'W, 4270 m	*Neoscalpellum debile*, *Planoscalpellum limpidus*, *Catherinum recurvitergum*, *Amigdoscalpellum rigidum*, *Trianguloscalpellum regium*.
249	16.XI.1971	45°50'N - 17°32,5'W, 4620-4690 m	*Neoscalpellum debile*, *Arcoscalpellum eponkos* n.sp., *Planoscalpellum limpidus*, *Trianguloscalpellum ovale*.
250	16.XI.1971	45°54,5'N - 17°29,5'W, 4631 m	*Neoscalpellum debile*.
251	18.XI.1971	47°38'N - 08°56'W, 3600-3360 m	*Arcoscalpellum tritonis*, *Amigdoscalpellum rigidum*, *Trianguloscalpellum regium*.
255	18.XI.1971	47°47'N - 07°56,5'W, 900-960 m	*Metaverruca recta*, *Bathylasma hirsutum*.
259	19.XI.1971	48°07,5'N - 07°51,5'W, 190 m	*Verruca stroemia*.
260	19.XI.1971	47°46'N - 08°04'W, 940-820 m	*Scalpellum scalpellum*, *Bathylasma hirsutum*.
Ponta Delgada		on the hull of the *Jean Charcot*	*Conchoderma auritum*.

APPENDIX 2

Cirriped species with present taxonomic status and geographical distribution and references citing them in the Azores Region. *, herein.

Species (Names used by the authors)	Authors	Present taxonomic status	Geographical distribution
HETERALEPADIDAE			
Heteralepas microstoma	Young, in press; *	same	Azores, Madeira, Great Meteor.
OXYNASPIDIDAE			
Oxynaspis celata	*	same	Cosmopolitan
O. patens	*	same	North Atlantic
POECILASMATIDAE			
Dichelaspis sessilis	Hoek, 1883	same	Azores
Glyptelasma hamatum	*	same	Circumtropical
Poecilasma aurantia	Gruvel, 1920; *	same	Eastern Atlantic
P. carinatum	Gruvel, 1920	*Glyptelasma carinatum*	Cosmopolitan
P. crassum	Gruvel, 1920	same	Circumtropical
P. kaempferi	Gruvel, 1920	? = *P. aurantia*	–
P. unguiculus	Aurivillius, 1894	? = *P. aurantia*	–
CALANTICIDAE			
Scalpellum acutum	Hoek, 1883; Gruvel, 1920; *	*Smilium acutum*	Cosmopolitan
S. calyculus	Aurivillius, 1898; Gruvel, 1920	*Aurivilialepas calyculus*	Azores
S. falcatum	Aurivillius, 1898; Gruvel, 1920	*Aurivilialepas falcata*	Azores, Great Meteor, off Portugal
S. Grimaldii	Aurivillius, 1898; Gruvel, 1920	*Scillaelepas grimaldi*	Azores
SCALPELLIOAE			
SCALPELLINAE			
Scalpellum vulgare	Gruvel, 1920	*Scalpellum scalpellum*	Northeastern Atlantic
SCALPELLIDAE			
MEROSCALPELLINAE			
Scalpellum alboranense	Gruvel, 1920	= *N. debile*	–
S. debile	Aurivillius, 1898; Gruvel, 1920; *	*Neoscalpellum debile*	North Atlantic
S. Edwardsii	Gruvel, 1900a; 1902a	= *N. debile*	–
SCALPELLIDAE			
ARCOSCALPELLINAE			
Arcoscalpellum michelottianum	Zevina, 1976; *	same	Cosmopolitan
Arcoscalpellum tritonis	*	same	Northeastern Atlantic
Planoscalpellum limpidus	Zevina, 1976; *	same	Northeastern Atlantic and Subantarctic
Scalpellum anceps	Aurivillius, 1898; Gruvel, 1920	*Teloscalpellum anceps*	Azores
S. atlanticum	Gruvel, 1900a; 1902a; 1920	*Teloscalpelum atlanticum*	Azores, off Portugal

Species (Names used by the authors)	Authors	Present taxonomic status	Geographical distribution
S. erectum	Aurivillius, 1898	= *A. michelottianum*	–
S. gigas	Gruvel, 1905	= *T. ovale* (not *S. gigas* Hoek)	North Atlantic
S. gracile	Gruvel, 1920	*Teloscalpellum gracile*	Northeastern Atlantic
S. incisum	Aurivillius, 1898; Gruvel, 1920	*Teloscalpelum incisum*	Azores
S. luteum	Gruvel, 1900a; 1902a; *	*Teloscalpellum luteum*	Azores
S. mamillatum	Aurivillius, 1898; Gruvel, 1920	*Amigdoscalpellum mamillatum*	Azores
S. molle	Aurivillius, 1898	(= *T. regium*)	–
S. pusillum	Aurivillius, 1898; Gruvel, 1920	*Weltnerium pusillum*	Newfoundland and Azores
S. recurvitergum	Gruvel, 1905; *	*Catherinum recurvitergum*	Azores, ?East Africa
S. regium	Gruvel, 1900a; 1902a	*Trianguloscalpellum regium*	North Atlantic
S. rigidum	Aurivillius, 1898	*Amigdoscalpellum rigidum*	Northeastern Atlantic
S. striatum	Gruvel, 1905; 1920	= *A. rigidum*	–
S. velutinum	Gruvel, 1920	= *A. michelottianum*	–
S. vitreum	Zevina, 1976	= *A. rigidum* (not *S. vitreum* Hoek)	
VERRUCIDAE			
Verruca inermis	Aurivillius, 1898; Gruvel, 1920	*Altiverruca inermis*	Azores
V. costata	Aurivillius, 1898; Gruvel, 1920	*Altiverruca costata*	North Atlantic
V. crenata	Aurivillius, 1898; Gruvel, 1920	*Altiverruca crenata*	Azores
V. erecta	Gruvel, 1900b; 1902a	*Altiverruca erecta*	Azores
Altiverruca gibbosa	*	same	Cosmopolitan
A. obliqua	*	same	Azores; off Spain
Verruca recta	Aurivillius, 1898; Gruvel, 1920; *	*Metaverruca recta*	Cosmopolitan
V. sculpta	Aurivillius, 1898; Gruvel, 1920	= *M. recta*	–
V. linearis	Gruvel, 1900b; 1902a; 1920	= *M. recta*	–
V. aequalis	Aurivillius, 1898; Gruvel, 1920; *	*Metaverruca aequalis*	Azores
V. trisulcata	Gruvel, 1900b; 1902a; 1920; *	*Metaverruca trisulcata*	Azores
V. cornuta	Aurivillius, 1898; Gruvel, 1920; *	*Costatoverruca cornuta*	Azores, Great Meteor
V. strömia	Gruvel, 1902a	probably a misidentification	–
V. spengleri	Gruvel, 1920; Baker, 1967; *	same	Azores, Madeira, Black Sea?
CHTHAMALIDAE			
Chthamalus stellatus	Pilsbry, 1916; Gruvel, 1920; Baker, 1967; *	same	Northeastern Atlantic
TETRACLITIDAE			
Tesseropora arnoldi n.sp.	*	same	Azores
Tetraclita squamosa elegans	Baker, 1967	= *T. arnoldi*, not *T. elegans* Darwin	–
Tesseropora atlantica	Newman and Ross, 1977	= *T. arnoldi* (in part, specimens from Azores)	–

Species (Names used by the authors)	Authors	Present taxonomic status	Geographical distribution
BATHYLASMATIDAE			
Balanus hirsutus	Gruvel, 1920; *	*Bathylasma hirsutum*	Northeastern Atlantic
BALANIDAE			
B. crenatus	Gruvel, 1920	probably a misidentification	–
B. amphitrite	Gruvel, 1920	probably a misidentification	–
B. trigonus	Pilsbry, 1916; Gruvel, 1920; Baker, 1967; *	same	Cosmopolitan
B. spongicola	Gruvel, 1920	probably a misidentification	–
B. tintinnabulum azoricus	Pilsbry, 1916; Gruvel, 1920; Baker, 1967; *	*Megabalanus azoricus*	Azores